	Type	Hits	Search Text
1	BRS	23	"LOCATION-BASED" near3 (terminal mobile portable)
2	BRS	5	("5983109" | "6058303" | "6456854" | "6505046" | "6505050").PN.
3	BRS	32	stor$3 near5 location near5 related near5 (terminal mobile portable)
4	BRS	527	stor$3 near5 location near5 information near5 (terminal mobile portable)
5	BRS	41971	defin$3 near3 (cell areas)
6	BRS	74	(stor$3 near5 location near5 information near5 (terminal mobile portable)) and (defin$3 near3 (cell areas))
7	BRS	107	information near5 location near5 related near5 (terminal mobile portable)
8	BRS	10	((stor$3 near5 location near5 information near5 (terminal mobile portable)) and (defin$3 near3 (cell areas))) and (information near5 location near5 related near5 (terminal mobile portable))
9	BRS	13	stor$3 near5 location near5 remind$3
10	BRS	13	stor$3 near5 location near5 remind$3
11	BRS	44125	455/$.ccls.
12	BRS	3	stor$3 near5 location near5 remind$3 and 455/$.ccls.
13	BRS	63952	stor$3 near5 location
14	BRS	373	stor$3 near5 remind$3
15	BRS	109	(stor$3 near5 location) and (stor$3 near5 remind$3)
16	BRS	8	(store storing stored) near5 location near5 remind$3
17	BRS	2	program$4 near5 location near5 remind$3
18	BRS	24	direction near5 (chang$3 alter$3) near5 (avoid$3 prevent$3) near5 (accident collision trash)
19	BRS	145	direction near5 (chang$3 alter$3) near5 hysteres$3

	Type	Hits	Search Text
20	BRS	0	information near5 location near5 related near5 (terminal mobile portable)and (direction near5 (chang$3 alter$3) near5 hysteres$3)
21	BRS	74877	(determin$3 program$4) near5 location
22	BRS	7	(direction near5 (chang$3 alter$3) near5 hysteres$3) and ((determin$3 program$4) near5 location)
23	BRS	1	proximity near5 distance near5 delay$3 near5 hysteres$3

US006360101B1

(12) **United States Patent**
Irvin

(10) **Patent No.: US 6,360,101 B1**
(45) **Date of Patent: Mar. 19, 2002**

(54) **CELLULAR PHONE THAT DISPLAYS OR SENDS MESSAGES UPON ITS ARRIVAL AT A PREDETERMINED LOCATION**

(75) Inventor: **David R. Irvin**, Raleigh, NC (US)

(73) Assignee: **Ericsson Inc.**, Research Triangle Park, NC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/223,904**

(22) Filed: **Dec. 31, 1998**

(51) **Int. Cl.**[7] **H04Q 7/20**

(52) **U.S. Cl.** **455/456**; 455/457; 455/459; 701/208; 701/201; 701/211; 342/357

(58) **Field of Search** 455/456, 457, 455/459; 701/208, 201, 211; 340/995, 996, 902, 904, 905; 379/133; 342/457; 370/328, 312

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,190,819 A	*	2/1980	Burgyan	340/23
5,677,837 A	*	10/1997	Reynolds	455/456
5,736,940 A	*	4/1998	Burgener	340/994
5,790,974 A	*	8/1998	Tognazzini	701/204
6,049,711 A	*	4/2000	Ben-Yehezkel et al.	455/414
6,085,148 A	*	7/2000	Jamison et al.	701/211
6,088,594 A	*	7/2000	Kingdon et al.	455/457
6,177,905 B1	*	1/2001	Welch	342/357.13

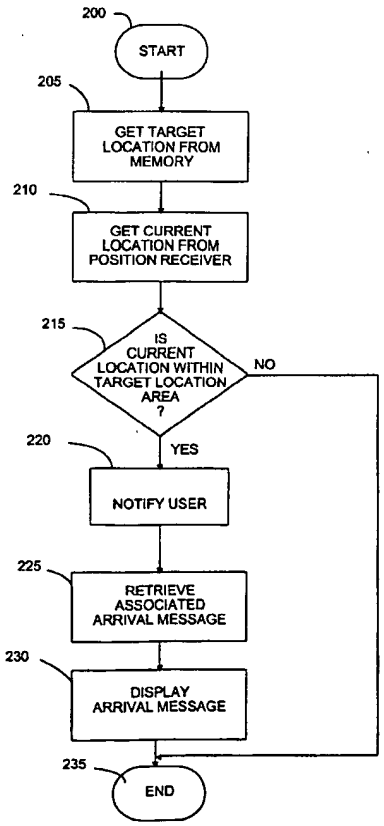
* cited by examiner

Primary Examiner—Thanh Cong Le
Assistant Examiner—Lana Le
(74) *Attorney, Agent, or Firm*—Coats & Bennett, P.L.L.C.

(57) **ABSTRACT**

A mobile communication device, such as a cellular telephone, determines its current location and compares the current location to one or more target locations stored in a target location memory. When the current location of the mobile communication terminal is within one of the target locations in memory, the mobile communication terminal annunciates its arrival by generating an audible alarm, or displays or transmits a predetermined arrival message associated with the target location. In one embodiment of the invention, target location data is determined entered manually via a keypad. In another embodiment, the target location data is obtained from a positioning receiver or a server connected to the communications network and loaded into the target location memory.

22 Claims, 5 Drawing Sheets



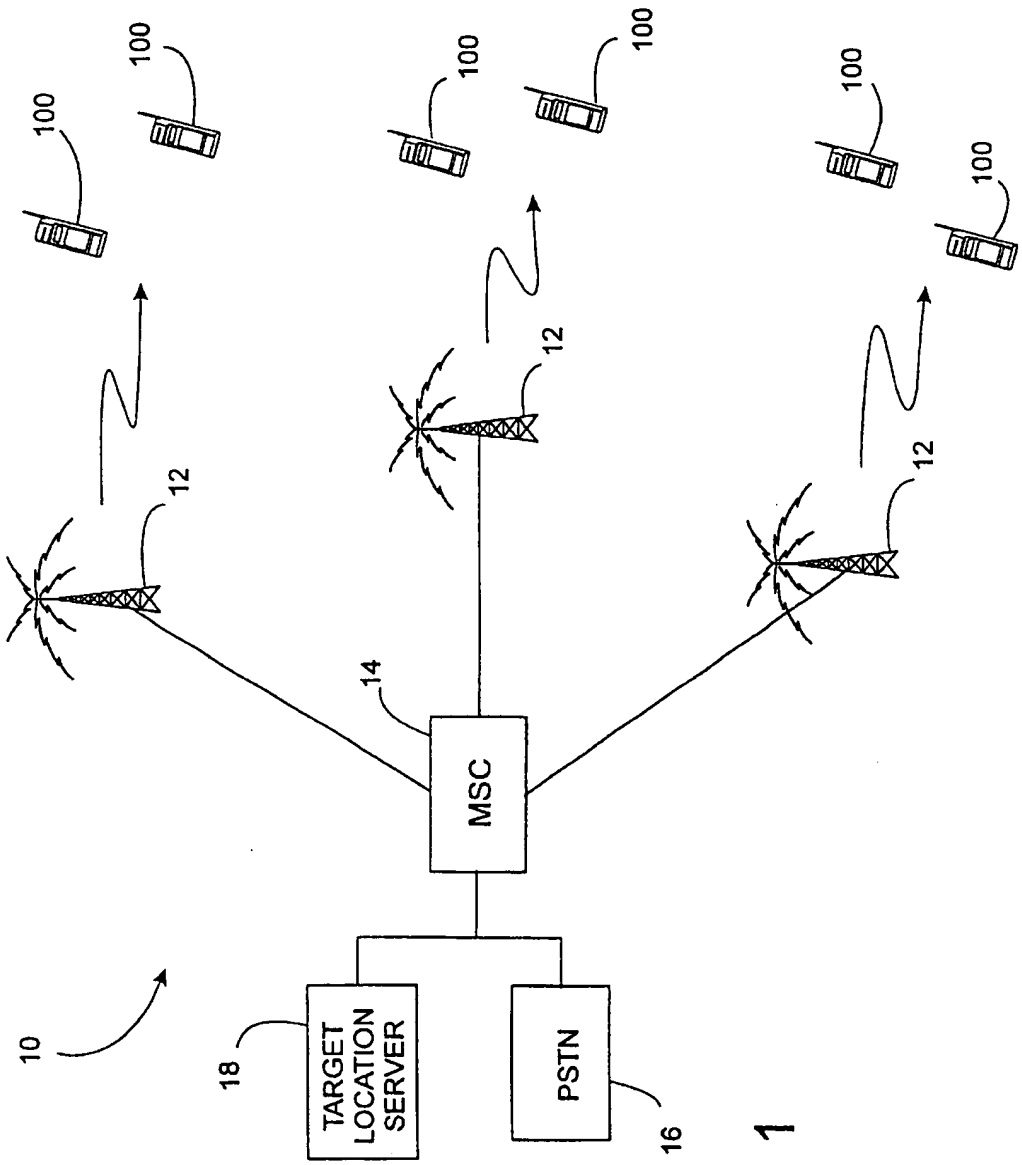

100
100
100
100
100
100
12
12
12
14
MSC
10
18
TARGET LOCATION SERVER
PSTN
16

FIG. 1

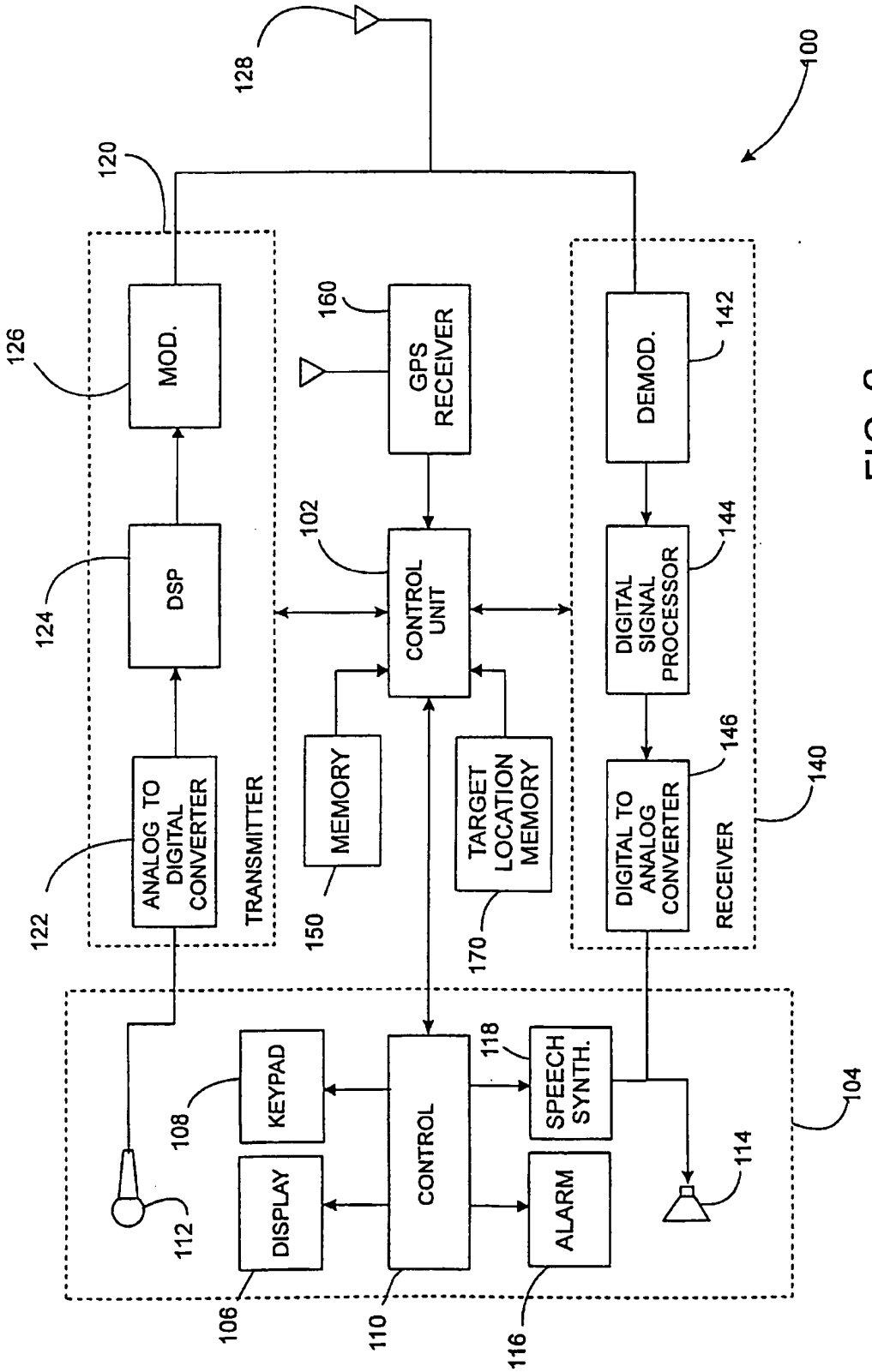

128
100
120
126
MOD.
160
GPS RECEIVER
DEMOD.
142
102
CONTROL UNIT
124
DSP
144
DIGITAL SIGNAL PROCESSOR
146
122
ANALOG TO DIGITAL CONVERTER
TRANSMITTER
150
MEMORY
170
TARGET LOCATION MEMORY
DIGITAL TO ANALOG CONVERTER
RECEIVER
140
104
108
KEYPAD
118
SPEECH SYNTH.
112
DISPLAY
CONTROL
ALARM
114
106
110
116

FIG. 2

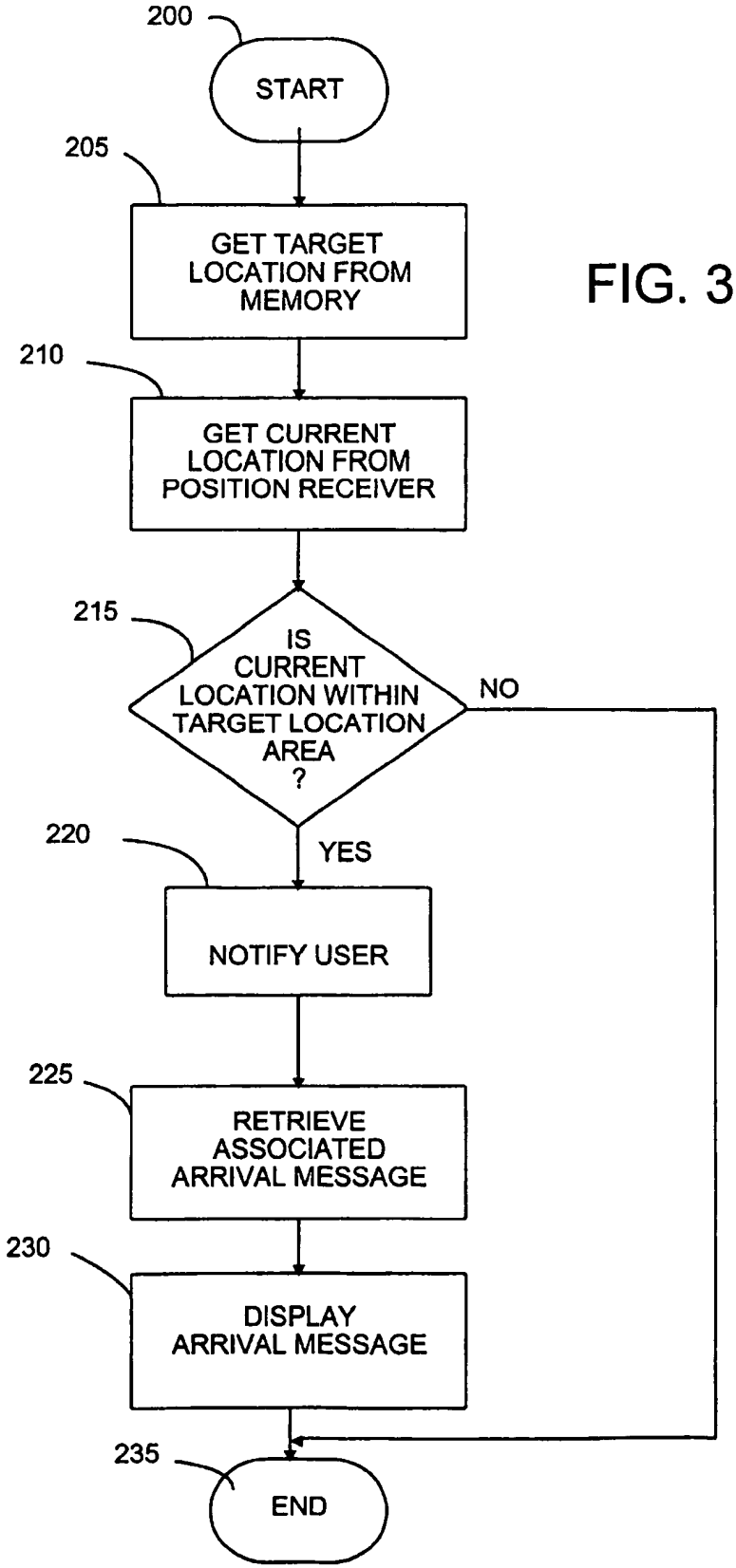

200
START
205
GET TARGET LOCATION FROM MEMORY
210
GET CURRENT LOCATION FROM POSITION RECEIVER
215
IS CURRENT LOCATION WITHIN TARGET LOCATION AREA ?
NO
YES
220
NOTIFY USER
225
RETRIEVE ASSOCIATED ARRIVAL MESSAGE
230
DISPLAY ARRIVAL MESSAGE
235
END

FIG. 3

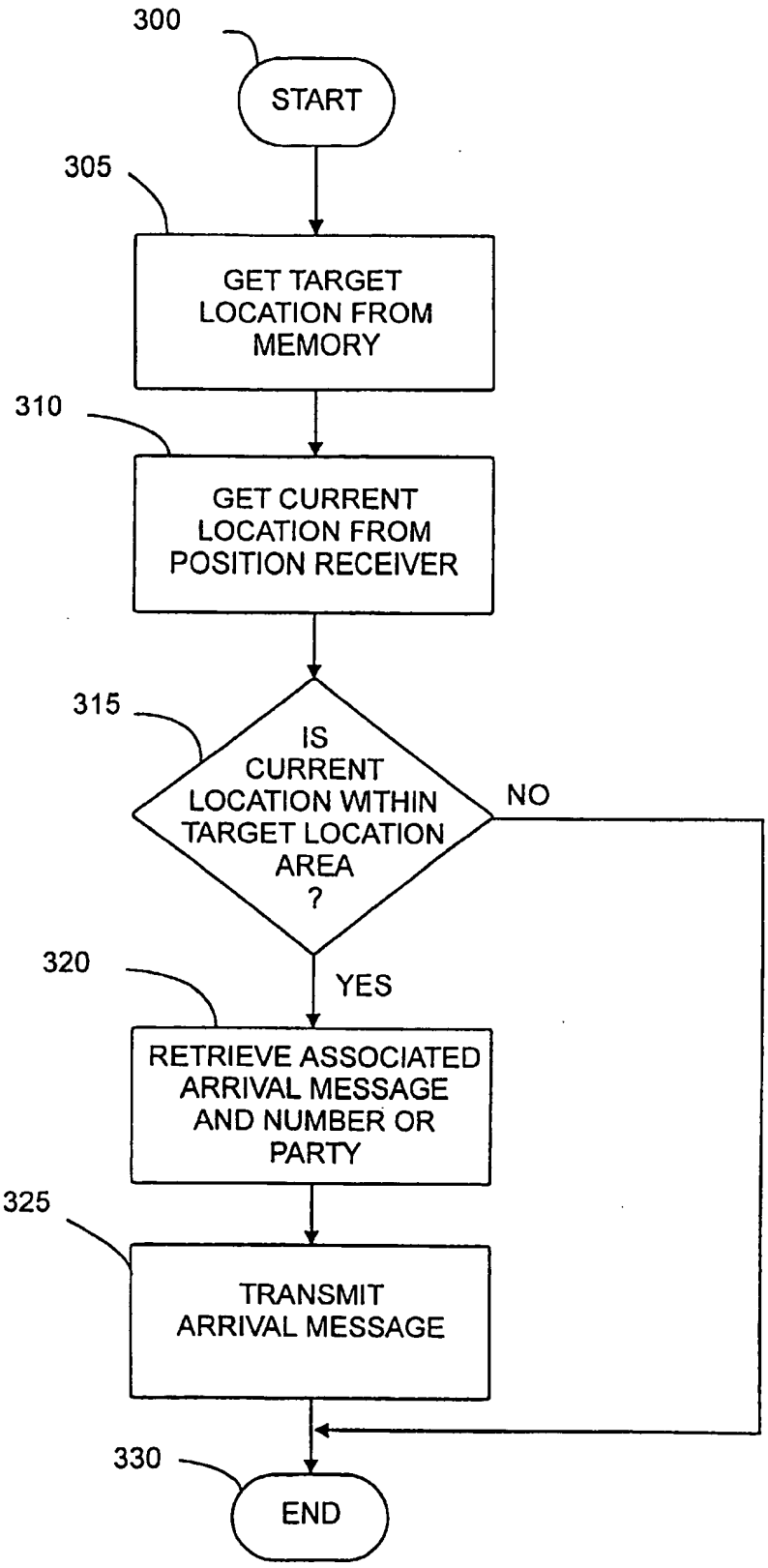

300
START
305
GET TARGET LOCATION FROM MEMORY
310
GET CURRENT LOCATION FROM POSITION RECEIVER
315
IS CURRENT LOCATION WITHIN TARGET LOCATION AREA ?
NO
YES
320
RETRIEVE ASSOCIATED ARRIVAL MESSAGE AND NUMBER OR PARTY
325
TRANSMIT ARRIVAL MESSAGE
330
END

FIG. 4

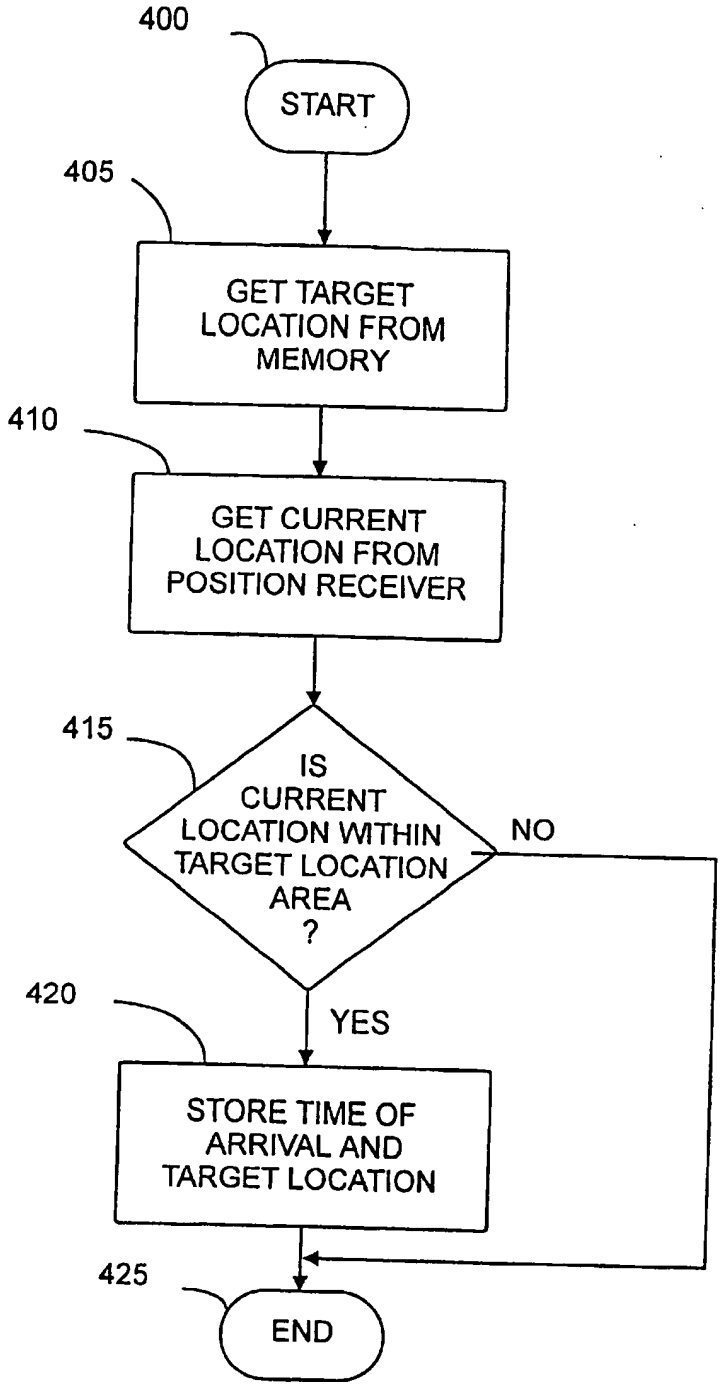

400
START
405
GET TARGET LOCATION FROM MEMORY
410
GET CURRENT LOCATION FROM POSITION RECEIVER
415
IS CURRENT LOCATION WITHIN TARGET LOCATION AREA ?
NO
YES
420
STORE TIME OF ARRIVAL AND TARGET LOCATION
425
END

FIG. 5

CELLULAR PHONE THAT DISPLAYS OR SENDS MESSAGES UPON ITS ARRIVAL AT A PREDETERMINED LOCATION

FIELD OF THE INVENTION

The present invention relates generally to methods for determining the location of a mobile station in a cellular communication system and, more particularly, to a cellular telephone that is programmed to take some action based upon its arrival at a predetermined location.

BACKGROUND OF THE INVENTION

It is a common practice for a person to place notes in their vehicle to remind them to perform certain tasks. For example, a person may place a note in their vehicle to remind them to pick up groceries on the way home from work. The method most frequently used is to write a note on a sticky note or loose piece of paper which is placed in a location in the vehicle so that it will be seen when the person enters the vehicle. For example, it is common to "stick" notes to an instrument panel or steering wheel, or place notes on loose pieces of paper in a vehicle seat. This method, however, is not foolproof. It is possible that the note will not remain in its original location. For example, a "sticky" note may detach from its original location and fall to the floorboard of a vehicle. Also, a note placed in a vehicle seat may be covered by other articles, or be blown when the door to the vehicle is opened. If the note does not remain in its original location, or if it is covered before it is seen by the user, it will not be effective.

It is also desirable in many cases for a person to periodically call the home or office while traveling to inform family members of their safe arrival, or to inform co-workers of their location for business reasons. However, a person may not always remember to call the home or office when arriving at the designated location. Also, the individual may be hurried when arriving at the predetermined location and not have sufficient time to call to report their arrival.

SUMMARY OF THE INVENTION

The present invention provides a mobile communication device, such as a cellular telephone, that displays or sends messages when it arrives at a predetermined destination. The phone may be used, for example, to store messages that the user wants to be displayed or sent to another party when the user arrives at predetermined locations. The phone includes a positioning receiver, such as a GPS receiver, and a target location memory. One or more predetermined target locations are stored in the target location memory. The phone periodically determines its current location based on a position signal received by the positioning receiver, and compares its current location to the predetermined target locations stored in memory. The phone is programmed to take some predetermined action when it arrives at the predetermined location or at a predetermined distance from the target location. For example, the phone can annunciate its arrival by sounding an alarm, display a stored message on the phone's display, or transmit the stored message to a remote station.

The phone of the present invention has many applications. For example, the user may want to be reminded when he or she arrives at a known location so that some tasks can be performed. The user can store a reminder in the phone which will be displayed when the user arrives at the target location. Also, it may be desirable in some cases to transmit a message to another party when the user arrives at the predetermined target location. For example, the user may want to notify another person when the user arrives at predetermined locations so that the other party will know that the user safely arrived. In this case, the user stores one or more predetermined locations in memory along with a corresponding arrival message. As the user arrives in each location, the corresponding arrival message is transmitted to the other party.

The present invention avoids the age-old problem of writing reminders on note pads, sticky notes, or other pieces of paper which can be lost or overlooked. Also, the present invention avoids the problem of having to stop to notify another person when the user has arrived at certain predetermined location.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a cellular communication network.

FIG. **2** is a block diagram of a mobile communication device of the present invention.

FIG. **3** is a flow diagram illustrating the operation of the mobile communication device.

FIG. **4** is a flow diagram illustrating the operation of a second embodiment of the mobile communication device.

FIG. **5** is a flow diagram illustrating the operation of a third embodiment of the mobile communication device.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, and particularly to FIG. **1**, a mobile communication system is shown. The mobile communication system, which is indicated generally by the numeral **10**, comprises a plurality of base stations **12** which are connected via a mobile services switching center (MSC) **14** to a terrestrial communications network such as the Public Switched Telephone Network (PSTN) **16**. Each base station **12** is located in and provides service to a geographic region referred to as a cell. In general, there is one base station **12** for each cell within a given network. Within each cell, there may be a plurality of mobile communication terminals **100** that communicate via radio link with the base station **12**. The base station **12** allows the user of the mobile communication terminal **100** to communicate with other mobile communication terminals **100**, or with users connected to the PSTN **16**.

The mobile services switching center **14** routes calls to and from the mobile communication terminal **100** through the appropriate base station **12**. Information concerning the location and activity status of the mobile communication terminal **100** is stored in a database which is connected to the MSC **14** so that the network can route communications to the base station that is currently servicing the mobile communication terminal **100**.

The MSC **14** also is connected to a target location server **18**. The function of the target location server **18** is to convert location data expressed in a particular format, such as a street address, to a geocoordinate that can then be used as hereinafter described. The target location server **18** includes a database for storing data that is needed to convert the location data to a geocoordinate. In this illustration, the communication network **10** is a digital cellular telephone network such as a network that operates according to TIA Standard IS-136.

Referring now to FIG. **2**, a mobile communication terminal of the present invention is shown and indicated generally

by the numeral **100**. The mobile communication terminal **100** shown in FIG. **1** is a fully functional radio transceiver capable of transmitting and receiving digital signals. Those skilled in the art will recognize, however, that the present invention may be implemented in an analog transceiver. The mobile communication terminal **100** includes a control unit or logic unit **102**, an operator interface **104**, a transmitter **120**, a receiver **140**, a memory **150**, a positioning receiver **160**, and a target location memory **170**.

The operator interface **104** includes a display **106**, keypad **108**, control unit **110**, microphone **112**, speaker **114**, alarm **116**, and speech synthesizer **118**. The display **106** allows the operator to see dialed digits and call status information. The keypad **108** allows the operator to dial numbers, enter commands, and select options. The control unit **110** interfaces the display **106** and keypad **108** with the control unit **102**. The microphone **112** receives audio signals from the user and converts the audio signals to analog signals. Speaker **114** converts analog signals from the receiver **140** to audio signals that can be heard by the user. The alarm **116** produces an audible tone to notify the user of an incoming call, or when displaying or sending arrival messages as will be hereinafter described. The speech synthesizer **118** converts text messages to an audible signal that can be played back through the speaker **114**.

The analog signals from the microphone **112** are applied to the transmitter **120**. The transmitter **120** includes an analog-to-digital converter **122**, a digital signal processor **124**, and a modulator **126**. The analog to digital converter **122** changes the analog signals from the microphone **112** into a digital signal. The digital signal is passed to the digital signal processor **124**. The digital signal processor **124** compresses the digital signal and inserts error detection, error correction and signaling information. The compressed and encoded signal from the digital signal processor **124** is passed to the modulator **126**. The modulator **126** converts the signal to a form that is suitable for transmission on a RF carrier.

The receiver **140** includes a demodulator **142**, a digital signal processor **144**, and a digital to analog converter **146**. Received signals are passed to the demodulator **142**, which extracts the transmitted bit sequence from the received signal. The demodulator **142** passes the demodulated signal to the digital signal processor **144** which decodes the signal, corrects channel-induced distortion, and performs error detection and correction. The digital signal processor **144** also separates control and signaling data from speech data. The control and signaling data is passed to the control unit **102**. Speech data is processed by a speech decoder and passed to the digital-to-analog converter **146**. The digital-to-analog converter **146** converts the speech data into an analog signal which is applied to the speaker **114** to generate audible signals which can be heard by the user.

The control unit **102**, such as a programmed microprocessor, functions to coordinate the operation of the transmitter **120** and the receiver **140**. Memory **150** stores the program instructions and data needed by the control unit **102** to control the communications terminal **100**. The functions performed by the control unit **102** include power control, channel selection, timing, as well as a host of other functions. The control unit **102** inserts signaling messages into the transmitted signals and extracts signaling messages from the received signals. The control unit **102** responds to any base station commands contained in the signaling messages, and implements those commands. When the user enters commands via the keypad **108**, the commands are transferred to the control unit **102** for action.

The positioning receiver **160** receives signals from a space-based or landbased station that transmits positioning data. For example, the positioning receiver **160** could be a GPS receiver. The received data is passed to the control unit **102** which uses the information to calculate the geographic location of the communication terminal **100**.

The target location memory **170** is used to store one or more target locations and associated arrival messages for selected target locations. In general, each target location stored in memory is identified by geocoordinates or other position data. Additional data, such as the number of a receiving party to whom arrival messages are sent, can also be stored in the target location memory **170**. The target location memory **170** can be an operational register within the control unit **102** or an address space in memory **150**. The target location memory **170** could also be a separate RAM or ROM memory.

The mobile communication terminal **100** of the present invention periodically compares its current location to the target locations stored in the target location memory **170**. When the mobile communication terminal **100** arrives at a specified target location, it will take some predetermined action. For example, the mobile communication terminal **100** could annunciate its arrival by activating an alarm, display an arrival message stored in memory to the user, or transmit the arrival message to another person. For purposes of this application, the term target location is not restricted to a single point, but can be considered a geographic area of some geometric shape, such as a circle, centered at a particular point. A mobile communication terminal **100** arrives at the target location when it is within the defined geographic area (e.g. within 2 miles of a designated center point).

Target location data (i.e. position data) can be input into target location memory **170** in a variety of ways that are well-known in the art. For example, target location data can be input using the mobile communication terminal's keypad **108** and display **106**, or downloaded from a computer or other device using a built-in system connector or infrared port on the mobile communication terminal **100**. The target location data can also be downloaded over the air interface.

Several methods can be used to obtain geocoordinates or other position data for a particular target location. One method is to drive to the target location and use the positioning receiver **160** to obtain geocoordinates or other position data for the target location. Another method would be to obtain the geocoordinates or other position data from a target location server **18** connected to the communication network **10**. For example, FIG. **1** shows a target location server **18** connected to the MSC **14**. The user enters a street address or other known address, which is transmitted to the base station **12** and forwarded via the MSC **14** to the target location server **18**. The target location server **18** converts the address of the target location to geocoordinates. The geocoordinates are transmitted back to the base station **12** and transmitted to the mobile communication terminal **100**. Another method is for the user to enter geocoordinates manually through keypad **108** after consulting a map having geocoordinates.

FIG. **3** is a flow diagram illustrating the basic operation of the mobile communication terminal **100** of the present invention. As shown in FIG. **3**, the mobile communication terminal **100** periodically compares its current location to the target locations stored in the target location memory **170**. The mobile communication terminal **100** retrieves a target location list from the target location memory **170** (block **205**) and gets its current location from the position receiver

140 (block 210). The mobile communication terminal 100 then compares the current location to each target location (block 215). If the mobile communication terminal 100 is within any target location in the target location memory 170, the mobile communication terminal 100 notifies the user, for example, by ringing the phone (block 220). The mobile communication terminal 100 then retrieves any arrival message stored in target location memory 170 associated with matching target location (block 225) and outputs the arrival message so that it can be read or heard by the user (block 230). For example, the message can be output to the display 106, or the speech synthesizer 118 can generate an audible message. If the current location does not fall within any target location stored in the target location list, then the procedure ends without any further action (block 235).

The mobile communication terminal 100 described in FIG. 3 is useful in an urban environment where target location can be specified by street addresses. The user can store arrival messages in the target location memory 170 which are displayed or played back upon arrival at the target location. For example, the user could store a message in the target location memory 170 to remind the user to stop at the grocery store when the user is in an area near the user's residence.

FIG. 4 shows the operation of an alternate embodiment of the mobile communication terminal 100. In this embodiment, the mobile communication terminal 100 is programmed to transmit a message to another party upon its arrival at one of the target locations stored in the target location list. The mobile communication terminal 100 periodically compares its current location to the target locations stored in the target location memory 170. The mobile communication terminal 100 retrieves a target location list from the target location memory 170 (block 305) and gets its current location from the position receiver 140 (block 310). The mobile communication terminal 100 then compares the current location to each target location (block 315). If the mobile communication terminal 100 is within any target location, the mobile communication terminal 100 retrieves the number of the party to be notified from the target location memory 170 and the corresponding arrival message (block 320). The mobile communication terminal 100 then formats and sends the arrival message using the SMS message facility (block 325). The message can optionally be displayed or played back to the user so that the user will know that a message has been sent. If the current location does not fall within any target location stored in the target location list, then the procedure ends without any further action (block 330).

The embodiment shown in FIG. 4 is useful to notify others when arriving at predetermined locations. For example, the mobile communication terminal 100 could be programmed to send a message to the user's spouse, parent, or other family member to inform a family member that the user has safely arrived at the target location.

FIG. 5 shows a third embodiment of the invention. In this embodiment, the mobile communication terminal 100 creates a log of arrival times at predetermined target locations. The mobile communication terminal 100 periodically compares its current location to the target locations stored in the target location memory 170 as in the previous embodiments. The mobile communication terminal 100 retrieves a target location list from the target location memory 170 (block 405) and gets its current location from the position receiver 140 (block 410). The mobile communication terminal 100 then compares the current location to each target location (block 415). If the mobile communication terminal 100 is within any target location, the mobile communication terminal 100 records the time of arrival and the target location in memory (block 420) and ends (block 425). If the current location does not fall within any target location stored in the target location list, then the procedure ends without any further action (block 425). The mobile communication terminal 100 can also display an arrival message to the user, or transmit an arrival message to a third party as previously described. This embodiment of the invention is useful to persons who may need to keep a travel log, such as travelling salesmen.

In the examples given thus far, the mobile communication terminal 100 is programmed to take some action upon its arrival at a predetermined location. The same method can be used, for example, to display or send messages as the user travels away from a particular location. For example, a starting location can be stored in the target location memory. The mobile communication device 10 could monitor the distance traveled from the starting location and either display or send messages when a predetermined distance from the starting location is reached.

Although the present invention has been described in connection with a digital cellular telephone network filling the role of the communication network, the invention is not limited to such use, and applies to all kinds of wireless communication networks. The mobile communication devices can be radio transceivers with digital message capability, personal computers or personal digital assistants equipped with wireless modems, and the like. Additionally, the invention may be carried out in specific ways other than those set forth herein without departing from the spirit and the essential characteristics of the present invention. Consequently, the present embodiments are to be construed in all aspects as illustrative and not restrictive. All changes coming within the meaning and equivalence range of the appended claims are intended to be embraced by these claims.

What is claimed is:

1. A mobile communication device capable of displaying and/or sending user-defined arrival messages upon its arrival at a predetermined location, comprising:

a. a memory for storing target location data identifying one or more target locations, and a corresponding arrival message for each of said target locations;

b. a positioning receiver for determining the current location of the mobile communication device;

c. a control unit operatively connected to said positioning receiver and said memory for comparing the current location of the mobile communication device to said target locations stored in said memory;

d. output means responsive to said control unit for outputting an arrival message corresponding to selected target location stored in said memory when the current location matches said selected target location.

2. The mobile communication device according to claim 1 wherein said output means is a display for displaying said arrival message.

3. The mobile communication device according to claim 1 wherein said output means is a speech synthesizer for converting said arrival message to an audible signal.

4. The mobile communication device according to claim 1 wherein said output means is a transmitter for transmitting said arrival message to a remote location.

5. The mobile communication device according to claim 1 wherein said target location data comprises a set of target location coordinates corresponding to said target locations.

6. The mobile communication device according to claim 1 wherein said target location data is obtained from said positioning receiver.

7. The mobile communication device according to claim 1 further including a keypad and wherein said target location data is entered via said keypad.

8. The mobile communication device according to claim 1 further including a transceiver for communicating with a target location server to obtain said target location data.

9. A method for using a mobile communication device to deliver messages upon arrival at a predetermined location, comprising:

a. storing target location data corresponding to one or more predetermined target locations in a target location memory and an associated arrival message for selected target locations;

b. determining the current location of the mobile communication device;

c. comparing said current location of the mobile communication device to said predetermined target locations stored in said target location memory;

d. outputting an arrival message associated with a selected target location when the current location of said mobile communication device matches the selected target location.

10. The method according to claim 9 wherein the arrival message is displayed on a display associated with the mobile communication device.

11. The method according to claim 9 wherein the arrival message is converted to an audible message.

12. The method according to claim 9 wherein the arrival message is transmitted to a designated party.

13. The method according to claim 9 further including inputting said target location data into said target location memory.

14. The method according to claim 9 wherein the target location data is input by entering said target location data on a keypad.

15. The method according to claim 9 wherein the target location data is input from a positioning receiver.

16. The method according to claim 9 wherein the target location data is input from a target location server connected to a communications network.

17. A mobile communication device capable of displaying and/or sending messages upon its arrival at a predetermined location, comprising:

a. a wireless transceiver for transmitting signals to and receiving signals from a remote station;

b. a memory for storing target location data identifying one or more target locations;

c. a positioning receiver for determining the current location of the mobile communication device;

d. a control unit operatively connected to said transceiver, said memory, and said positioning receiver for comparing the current location of the mobile communication device to said target locations stored in said memory and performing a predetermined action when the current location matches one of said target locations.

18. The mobile communication device according to claim 17 further including an audible alarm operatively connected to said control unit for generating an audible signal when the current location matches one of said target locations.

19. The mobile communication device according to claim 17 further including a display operatively connected to said control unit for displaying a predetermined arrival message when the current location matches one of said target locations.

20. The mobile communication device according to claim 19 wherein said arrival message is a user-defined message.

21. The mobile communication device according to claim 20 wherein said arrival message is stored in said memory.

22. The mobile communication device according to claim 17 wherein said transceiver transmits a predetermined arrival message to a remote location under direction of said control unit when the current location of said mobile communication device matches one of said target locations.

* * * * *

US006563430B1

(12) **United States Patent**
Kemink et al.

(10) **Patent No.: US 6,563,430 B1**
(45) **Date of Patent: May 13, 2003**

(54) **REMOTE CONTROL DEVICE WITH LOCATION DEPENDENT INTERFACE**

(75) Inventors: **Joost Kemink**, Campbell, CA (US); **Yevgeniy Eugene Shteyn**, Cupertino, CA (US)

(73) Assignee: **Koninklijke Philips Electronics N.V.**, Eindhoven (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/210,416**

(22) Filed: **Dec. 11, 1998**

(51) **Int. Cl.**[7] **G08B 5/22**
(52) **U.S. Cl.** **340/825.49**; 340/825.72
(58) **Field of Search** 340/825.49, 825.69, 340/825.72, 310.01; 725/37; 345/156, 173, 702, 835, 157

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,101,191 A	*	3/1992	MacFadyen et al.	340/310.01
5,109,222 A	*	4/1992	Welty	340/825.72
5,552,806 A		9/1996	Lenchik	345/156
5,642,303 A		6/1997	Small et al.	364/705.05
5,767,919 A	*	6/1998	Lee et al.	725/37

FOREIGN PATENT DOCUMENTS

EP	0626635	11/1994	G06F/3/00
EP	0801342	10/1997	G06G/3/023

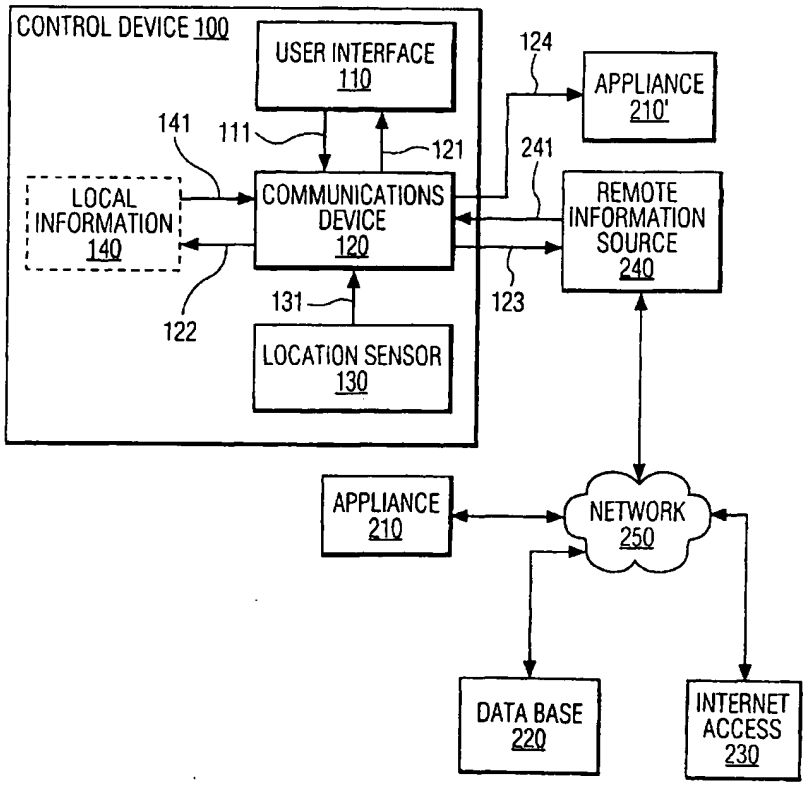
* cited by examiner

Primary Examiner—Michael Horabik
Assistant Examiner—William Bangachon
(74) *Attorney, Agent, or Firm*—Gwenaelle LePennec

(57) **ABSTRACT**

A user control interface is provided that is location dependent. Context control parameters are associated with location, and the user control interface is customized to the context within which the device is being operated. The control interface includes the presentation of context sensitive information and the communication of corresponding context sensitive user commands via the interface. The location determination is effected using any number of commonly available techniques, such as direct entry, infrared sensors and active badges for relative positioning, as well as the conventional absolute positioning devices such as LORAN and GPS. Preferably, the device communicates with a remote information source that provides the context sensitive control information. The remote information source may be a home network server, an Internet server, a public service network, or other communication network.

18 Claims, 4 Drawing Sheets



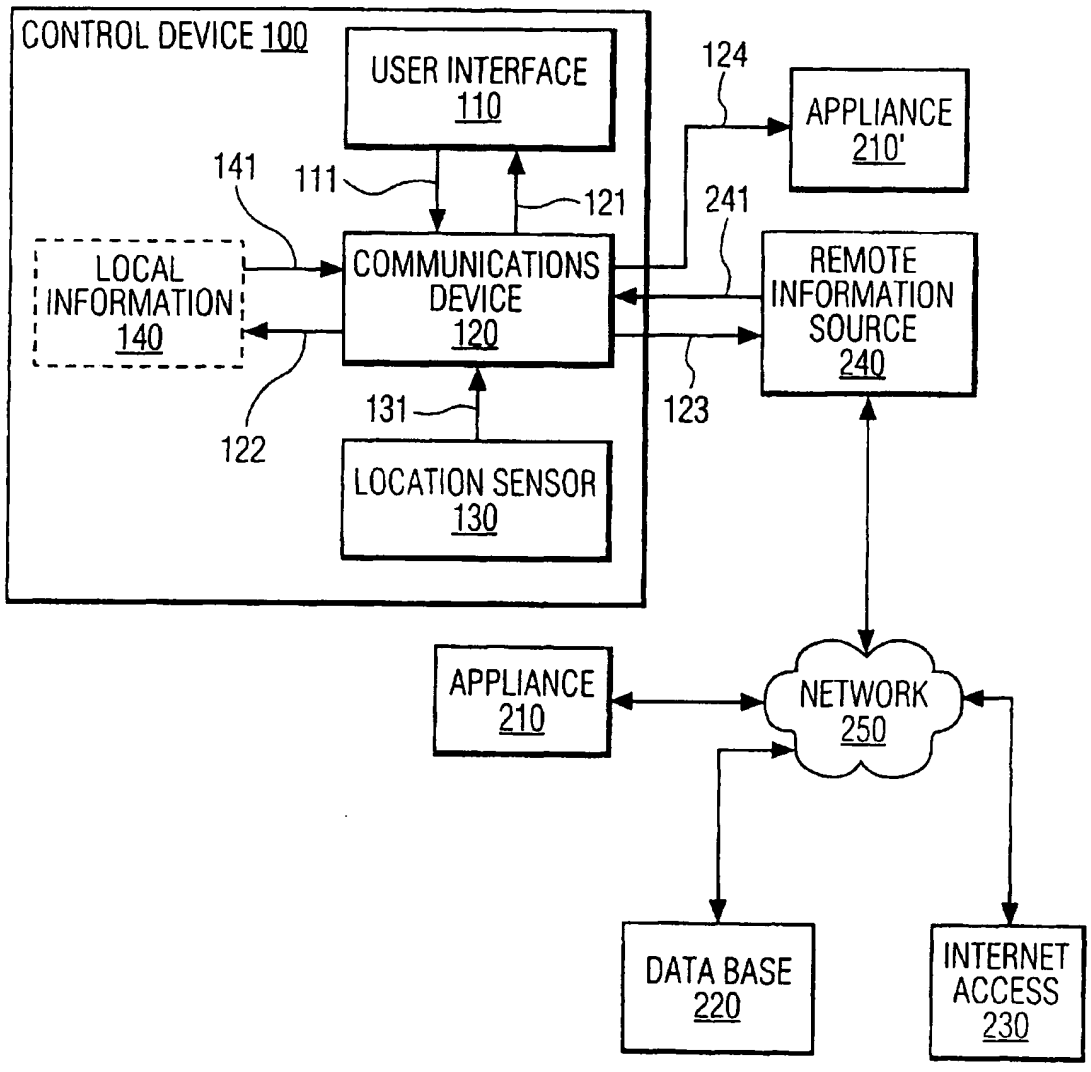

CONTROL DEVICE 100
USER INTERFACE 110
124
APPLIANCE 210'
141
111
121
241
LOCAL INFORMATION 140
COMMUNICATIONS DEVICE 120
REMOTE INFORMATION SOURCE 240
131
123
122
LOCATION SENSOR 130
APPLIANCE 210
NETWORK 250
DATA BASE 220
INTERNET ACCESS 230

FIG. 1

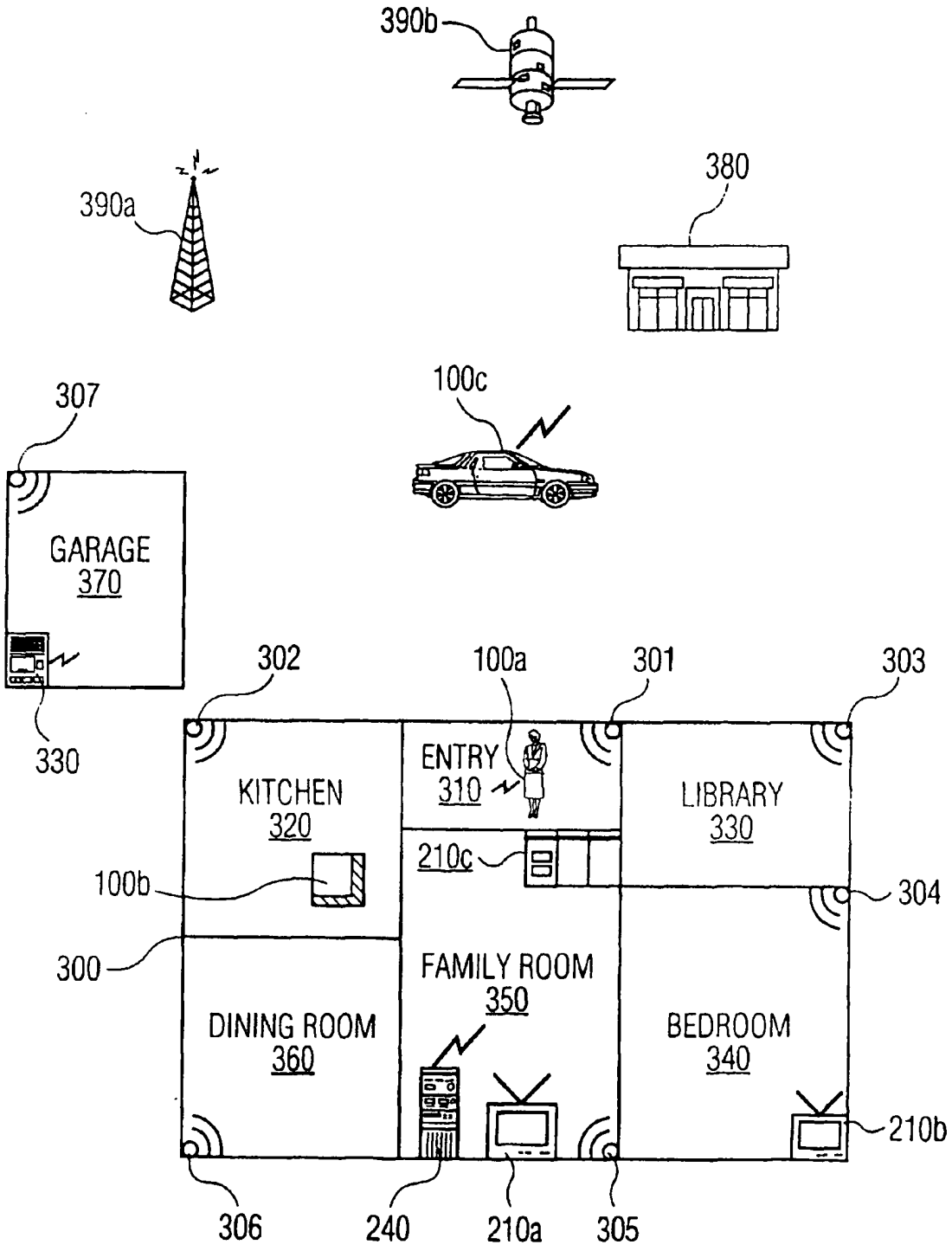

390b
390a
380
307
100c
GARAGE
370
330
302
100a
301
303
KITCHEN
320
ENTRY
310
LIBRARY
330
210c
100b
304
300
FAMILY ROOM
350
DINING ROOM
360
BEDROOM
340
210b
306
240
210a
305

FIG. 2

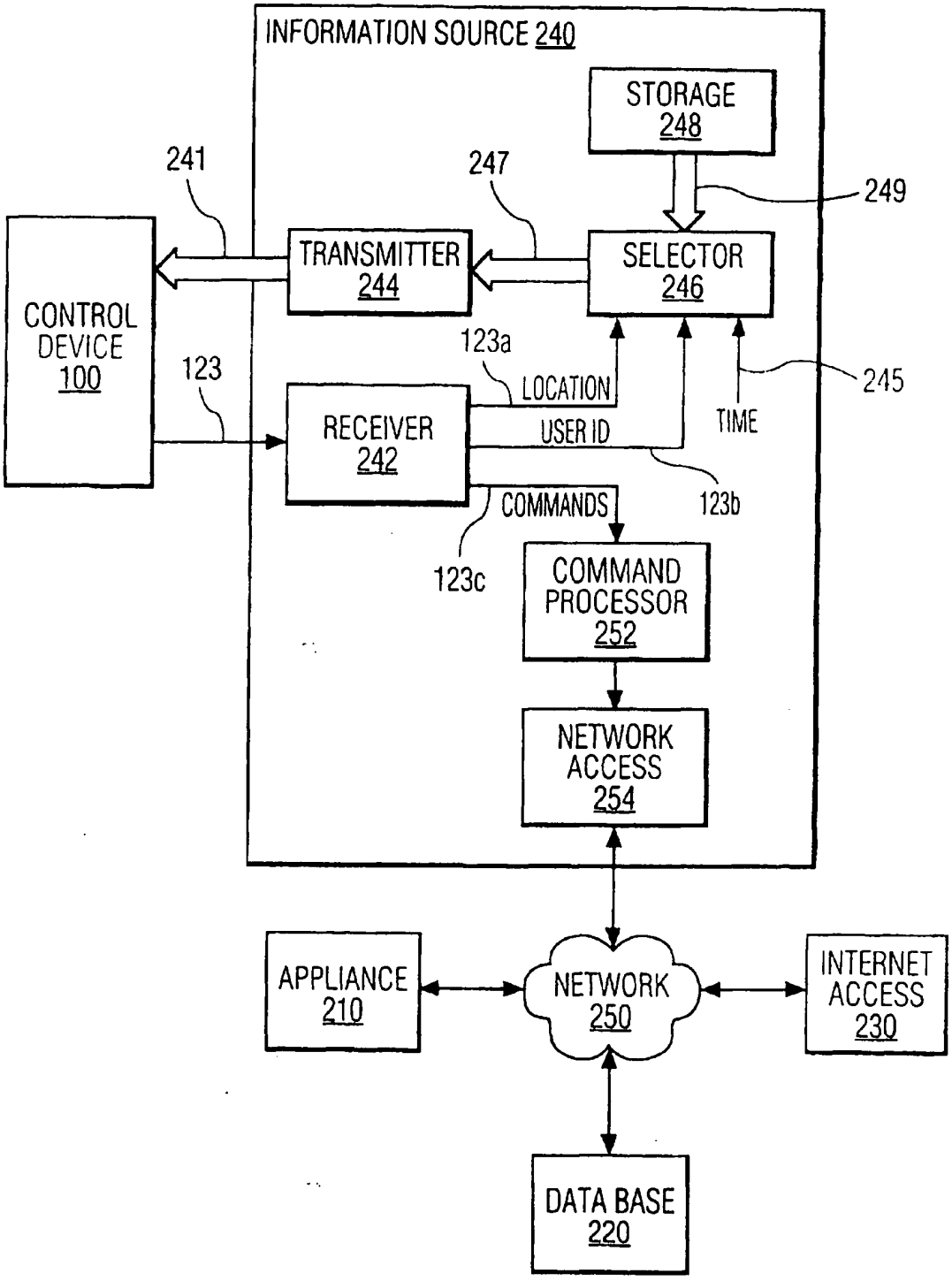

INFORMATION SOURCE 240
STORAGE 248
241
247
249
CONTROL DEVICE 100
TRANSMITTER 244
SELECTOR 246
123a
LOCATION
123
RECEIVER 242
USER ID
TIME
245
123b
COMMANDS
123c
COMMAND PROCESSOR 252
NETWORK ACCESS 254
APPLIANCE 210
NETWORK 250
INTERNET ACCESS 230
DATA BASE 220

FIG. 3

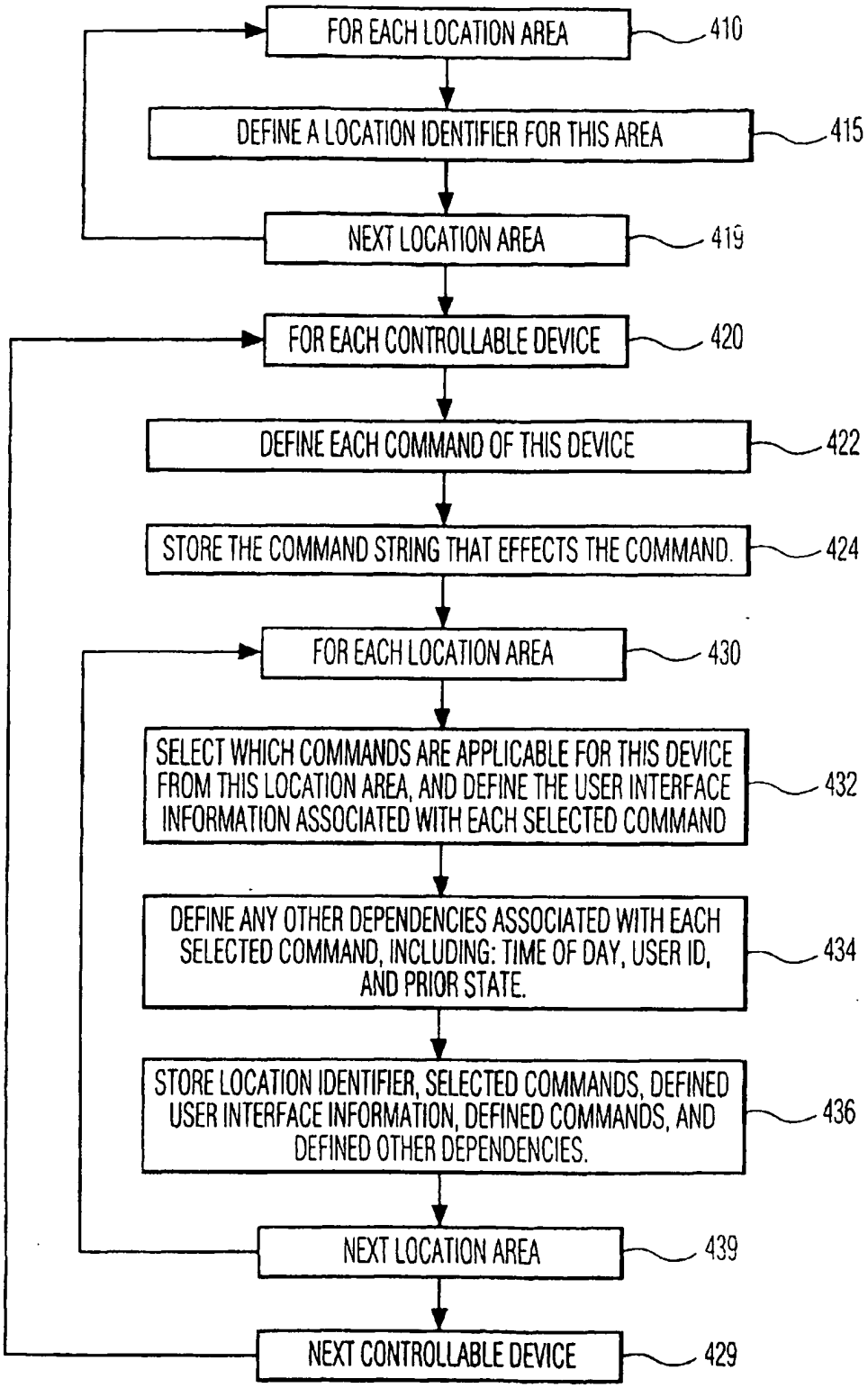

FOR EACH LOCATION AREA
410
DEFINE A LOCATION IDENTIFIER FOR THIS AREA
415
NEXT LOCATION AREA
419
FOR EACH CONTROLLABLE DEVICE
420
DEFINE EACH COMMAND OF THIS DEVICE
422
STORE THE COMMAND STRING THAT EFFECTS THE COMMAND.
424
FOR EACH LOCATION AREA
430
SELECT WHICH COMMANDS ARE APPLICABLE FOR THIS DEVICE FROM THIS LOCATION AREA, AND DEFINE THE USER INTERFACE INFORMATION ASSOCIATED WITH EACH SELECTED COMMAND
432
DEFINE ANY OTHER DEPENDENCIES ASSOCIATED WITH EACH SELECTED COMMAND, INCLUDING: TIME OF DAY, USER ID, AND PRIOR STATE.
434
STORE LOCATION IDENTIFIER, SELECTED COMMANDS, DEFINED USER INTERFACE INFORMATION, DEFINED COMMANDS, AND DEFINED OTHER DEPENDENCIES.
436
NEXT LOCATION AREA
439
NEXT CONTROLLABLE DEVICE
429

FIG. 4

REMOTE CONTROL DEVICE WITH LOCATION DEPENDENT INTERFACE

FIELD OF THE INVENTION

This invention relates to the field of data communications and control and in particular to the field of handheld and mobile control devices.

DESCRIPTION OF RELATED ART

The use of handheld electronic devices for controlling other devices is becoming increasingly common. Consumer electronic devices, such as televisions and stereos, are controlled with remote control devices, and "universal" (user-programmable) remote controllers are available for controlling multiple consumer electronic devices. Each of these devices typically has a user interface that is optimized for the tasks that the device is expected to perform. For example, a television remote control has channel and volume controls; a tape deck remote control has fast-forward, play, record, and rewind controls; and so on. The aforementioned "universal" controller, however, contains a myriad assortment of controls to facilitate the control of a variety of devices.

Because a universal controller is designed to operate many varied devices, it is often difficult to use because of the large number of control buttons or switches. Often, a user may only have two or three of the possible devices that the universal controller can control, and many of the buttons on the universal controller are unused. In like manner, the user may have many of the devices that the universal controller may control, but they may not necessarily be located in a common area within the sphere of control of the universal controller.

The use of handheld electronic devices for managing information is also becoming increasingly common. Portable "palm-top" information processing devices are commonly used to organize, record, and present data and information. For example, electronic "day-timers" are used to record scheduled appointments and events in a calendar format, and to operate as an alarm clock to remind the user of these appointments and events as their schedule time arrives. Electronic notepads are used to record and present telephone lists, shopping lists, notes, recipes, and so on. Personal navigation devices are available that illustrate the location of the device on a presentation of a street map.

U.S. Pat. No. 5,642,303 relates to configuring a time- and location- based computing infrastructure. U.S. Pat. No. 5,642,303 addresses the problem of how to pro-actively remind people of tasks to do. A system is disclosed that uses unique radio frequency (RF) beacons in key locations, for example, one in a home, another beacon in an office, yet another beacon in a car, and so on, to notify a portable information processing device of its proximity to each location. The information processing device is programmed to supply location-dependent reminder messages in dependence upon the receipt of each recognized RF beacon.

U.S. Pat. No. 5,552, 806 relates to an apparatus for positioning selectable function icons on a display. Again, the function icons displayed are determined by a locale dependent radio signal indicating, e.g., the home locale, the work locale or a mobile locale. In the home locale, for example, the user him/herself has to navigate through the hierarchy of icons available in this specific locale.

BRIEF SUMMARY OF THE INVENTION

Although the prior art devices mentioned above provide a mechanism to select locale dependent icons, it does not solve the problem mentioned above, where the user has to either juggle a (too large) number of remotes or has to navigate through a hierarchy of control layers, all associated with, e.g., the home environment or the office environment, in order to find the appropriate control level. It is therefore an object of this invention to provide a device user interface that is optimized, or customized, for the function that the device is intended to perform within the home, or within the office. It is a further object of this invention to maximize the functions that the device may perform, thereby providing maximal utility to a user with a minium of user-interaction.

These object and others are achieved by determining the control functionality of a user interface based upon the context within which the device is being used. Context parameters are associated with location relative to the home environment, and a device in accordance with this invention provides a control interface that is modified and optimized in dependence upon location and other parameters. The interface includes the presentation of context sensitive information and the communication of context sensitive user commands and information via the interface. The location determination is effected using any number of commonly available techniques, such as infrared sensors and active badges for relative positioning, conventional absolute positioning devices such as LORAN and GPS, as well as the beacon sensing devices disclosed in the aforementioned U.S. Pat. No. 5,642,303, the contents of which are incorporated herein by reference.

In a preferred embodiment, the device communicates with a remote information source that provides the context sensitive control information in dependence upon a location parameter that is communicated from the device. The remote information source may be a home network server, an Internet server, a public service network, or other communication network.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained in further detail, and by way of example, with reference to the accompanying drawings wherein.

FIG. **1** is a block diagram of a control system in accordance with this invention;

FIG. **2** is a diagram of an implementation of a context sensitive control system in accordance with this invention;

FIG. **3** is a block diagram for a remote information source in accordance with this invention; and

FIG. **4** is a flowchart for storing context dependent control information at an information source in accordance with this invention.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** is a block diagram of a control system according to the invention. The control system includes a control device **100**, one or more appliances **210**, and one or more information sources **140, 240**. The example control device **100** includes a user interface **110**, a communicator **120**, a location sensor **130** and an optional local information source **140**. The communicator **120** provides a communications path **123, 241** with a remote information source **240**. In accordance with this invention, the communicator **120** provides context sensitive information **121** to the user interface **110** for presentation to the user of the control device **100**. The location sensor **130** provides a location parameter **131** to the communicator **120**, and the communicator **120**

receives information **141, 241** from the local **140** and remote **240** information sources respectively, based on this location parameter **131**. The location parameter **131** may be an absolute location coordinate, such as a latitude and longitude, or a relative location, such as within the vicinity of a known location coordinate, or a descriptive location, such as the name of a location. The location parameter **131** is used to establish a context within which the control device **100** is being operated. For example, the control device **100** can be expected to be used in a different context in one room of a house, such as a kitchen, than another room, such as a bedroom, because the tasks that are typically performed in one room are different from the tasks typically performed in another room.

The operation of the control device **100** is best illustrated by example. FIG. **2** illustrates an example implementation of a context sensitive control system in accordance with this invention. FIG. **2** illustrates three control devices **100***a*, **100***b*, and **100**c. The control device **100***a* is a portable device that is carried by a user. As the user enters the house **300**, the location sensor **130** in the control device **100***a* detects an emission from an emitter **301** that is mounted in the entry area **310**. The location sensor **130** in the control device **100***a* notifies the communicator **120** in the control device **100***a* that it is in the vicinity of the emitter **301** that is associated with the entry area **310**. Knowing that the user is in the entry area **310**, the communicator **120** in the control device **100***a* queries one or both of the information sources **140, 240** for control information that is associated with, or context related to, the entry area **310**.

In this example, assuming that the house **300** is automated, the information sources **140, 240** communicate the automation commands and the associated menus or other user interface elements that are appropriate to the automation. For example, the information sources **140, 240** may communicate a list of lights that are remotely controllable by the control device **100***a*, or more appropriately, a list of the lights that are in the vicinity of the entry area **310**. The communicator **120** in the control device **100***a* relays this information to the user interface **110** in a form that facilitates the control of these lights by the user, for example by providing the list on a touch sensitive pad, wherein the user turns the lights on and off by touching the area on the pad corresponding to the particular light in this list. In a graphics based system, the information sources **140, 240** may communicate a floor plan diagram, and the user turns lights on and off in a room by touching the room area in the floorplan that is displayed on the interface **110**. The location parameter **131** may also include an orientation of the control device **100**, so that, for example, options are provided for lights or appliances that are in the orientation direction from the control device **100**. Techniques for presenting text, drawings, and associated options are common to one of ordinary skill in the art, and include for example, the hypertext markup language, HTML, that is used to display pages of information with links to other information or processes. Note that, in this example, until the control device **100***a* is located in the entry **310**, the user interface **110** of the control device **100***a* is not encumbered by the list of lights or the floorplan diagram.

The local and remote information sources **140, 240** may also provide information regarding electronic appliances **210**, such as televisions, computers, and music systems, that may be controlled via a home networks, such as HAVi, X-10, Home API, IEEE 1394, and the like, or via other networks, using for example TCP/IP, SCSI, or other standard interfaces and protocols. Consistent with the terminology used in such networks, the term appliance is used herein to include any controllable item. The options of each appliance **210** on the network that are appropriately controllable from the entry area are communicated by the information source **240**, via link **241**, to the communicator **120** of control device **100***a*. For example, a television appliance **210***a* that is in the adjacent family room **350** may be appropriately controlled from the entry area **310**, but not the television appliance **210***b* that is in the bedroom area **340**. In this example, the communicator **120** of the control device **100***a* presents a menu of options for the television appliance **210***a* to the user, via the user interface **110**. These options may be mere button selections, emulating a conventional television remote controller, or may include more meaningful information. Assuming, for example, that the information source **240** has access to an electronic television program guide, via for example an Internet connection **230**, the names of each program currently available for viewing on the television appliance **210***a* may be presented to the user for selection via the user interface **110** of the control device **100***a*. Similarly, the titles of each CD, or of each song on each CD in a music appliance **210***c* may be presented for selection by the user.

Subsets of menus of options may also be provided. For example, if the television appliance **210***b* in the bedroom **340** is turned on when the user is at the entry **310**, the control device **100***a* may present the user the option to turn the television **210***b* off before exiting the house **300**. Other options for the television **210***b*, such as channel selection, need not be presented if the user is in the entry area **310**, or if the television **210***b* is not turned on. Similarly, global or group options may be presented to a user in the entry (exit) area **310**, such as an option to turn off all appliances, or turn off all predefined appliances in a list, and so on.

The context of a control device **100** may be based upon other parameters as well. For example, the context may be dependent upon the prior location(s) of the control device **100**, so as to distinguish, for example, between an entry or an exit. Likewise, it may be dependent upon other external parameters, such as the time of day, the time of the year, and the like. For example, the option to turn on particular appliances, such as lights or televisions, may not be presented during particular temporal periods. In such an embodiment, for example, the list or diagram of lights might only be presented during hours of twilight or darkness, seasonably adjusted. The context may also be dependent upon other external objects as well. For example, the state of a switch on an entry door, or a motion detector outside the door, may be used to determine whether the user is leaving or entering the home, and different options would be presented in each case. The context may also be dependent upon the presence of other users of control devices **100**. For example, the option to turn off an appliance in another room may be omitted if another user is in the other room, or the option may include a notification that the other room is occupied and issue an "are your sure?" query to confirm the turning off of the appliance.

In accordance with another aspect of this invention, the control device **100***a* may effect predefined context-sensitive default control actions, such as turning on a preset list of lights when the control device **100***a* first reports that it is in the entry area **310**, and turning off a preset list of lights and appliances when the control device **100***a* reports an exit from entry area **310**.

The control device **100***a* may also effect state dependent context sensitive actions. For example, if the prior state of the control device **100***a* is that it is located in the family room **350** and the television appliance **210***a* is tuned to a

particular channel, and the next state is the reported presence of the control device **100***a* in the bedroom **340**, the control device **100***a* may automatically turn on the television appliance **210***b*, tune it to the particular channel, and subsequently turn off the television appliance **210***a*. As would be evident to one of ordinary skill in the art, this sequence may also be dependent upon the time of day, such that the television appliance **210***a* in the family room **350** is only turned off automatically if the time is later than, for example, 10 p.m. In either event, the control device **100***a* will thereafter present control options relative to the television appliance **210***b* in the bedroom **340**, rather than television appliance **210***a* in the family room **350**, or with a reduced set of options for the television appliance **210***a* in the family room **350**, such as volume control and power.

In accordance with another aspect of this invention, the context sensitive information provided by the communicator **120** of the control device **100***a* may also be dependent upon the particular user of the control device **10***a*. For example, the associated user of control device **100***a* may have particular preferences with regard to channels or programs to watch on the television appliance **210***a*. In this example, the aforementioned list of channels or names of programs presented to the user for the television appliance **210***a* will be filtered to only provide those of interest to the particular user, or sorted to provide the entire list, but in the order of the particular user's preferences.

As the user enters each area **310, 320, 330, 340, 350,** and **360** of the house **300**, the control device **100***a* detects emissions from corresponding emitters **301, 302, 303, 304, 305,** and **306**. In a preferred embodiment, to limit the field of emissions to each area within a home, the emitters **301–306** are infrared emitters, each sending a respective signal having a unique pattern that is identifiable by the location sensor **130**. In like manner, emitter **307** is associated with the garage area **370**. The uniquely identifiable pattern of each signal of each emitter **301–307** serves as the location parameter that is communicated from the location sensor **130** to the communicator **120**. If the control device **100***a* includes a local information source **140**, the association between the identified emitter **301–307** and the physical locale **310–370** is effected within the control device **100***a* so that the appropriate information **141** corresponding to the location **310–370** is provided If the control device **100***a* does not include a local information source **140**, the association between the identified emitter **301–307** and the physical locale **310–370** may be effected in the remote information source **240**. That is, the communicator **120** relays the location parameter **131** from the location sensor **130** to the remote information source **240**, via link **123**, and the remote information source **240** is preprogrammed to extract the context sensitive information **241** based upon the location parameter **131**. In like manner, the user may be provided the option of entering the location parameter **131** directly, thereby eliminating the need for beacons in all or some of the locations. For example, the user interface **110** may provide a "location" option, wherein the user selects from among a predefined list of named locations; alternatively, the control device **100** could contain a voice recognition device, and the user could say the name of a location, such as "kitchen", "master bedroom", etc., that is used by the location sensor **130** to determine the location parameter **131**. Similarly, the location sensor **130** could contain a relative location sensing device such as accelerometer that is used to determine the movements of the control device **100** relative to a predefined reference point, such as the location of a recharging station for the control device **100**. In such an embodiment, the sensor **130** determines the location parameter **131** based on movements relative to the reference point. If the location sensor **130** is an absolute positioning device, such as a GPS device, the information source **140, 240** in a preferred embodiment contains a "map" of bounding polygons that associates a geographic coordinate to the physical locale **310–370** containing this coordinate. These and other techniques for determining or defining a location parameter **131** and associating it with a physical area or region are common to one of ordinary skill in the art.

The aforementioned filtering of the context sensitive information **241** based upon other context parameters such as the particular user, the time of day, and the like may be effected in the communicator **120** or in the remote information source **240**. In the preferred embodiment, the remote information source **240** contains a rules database that determines the information **241** to be communicated to the user via the user interface **110** based upon the location parameter **131** and other context determining parameters, while the communicator **120** controls the flow and format of the information and control signals **111, 121, 122, 123, 124, 131, 141,** and **241** among the components. Other mechanisms for choosing the information that is to be communicated based on a location parameter **131** would be evident to one of ordinary skill in the art.

The control device **100** of FIG. **1** effects the control of remote devices in a variety of manners. In a preferred embodiment, control is effected via a network **250** that interconnects the controlled devices and information sources. The user communicates commands **111** via the user interface **110** to the communicator **120**, and these commands or their operational equivalents are communicated to the remote information source **240** via the link **123**. Illustrated in FIG. **2** is a relay device **330** that relays information to the remote information source **240** from a control device **100**, thereby extending the range of communications between the control device **100** and the remote information source **240**. In this preferred embodiment, the remote information source communicates the necessary control commands over the network **250** to effect the control of the appliances **210** that are on the network **250**. For example, to reduce complexity at the control device **100**, the remote information source **240** communicates the context sensitive information **241** to the user via an indexed list, or an indexed diagram. When the user selects a user option associated with the context sensitive information **241**, only the index of the selected item in the list or diagram is communicated as an operational command from the communicator **120** to the remote information source **240**. The remote information source **240** then executes the control commands that correspond to the communicated operational command from the communicator **120** to effect the selected option. For example, in accordance with the Home API standard, to change the channel of a television appliance **210***a* to channel 8, the Basic command would be in the form:

GetObject("home:family room"). Channel=8.

Other standards and protocols provide similar control commands, and would be familiar to one of ordinary skill in the art. Alternatively, in a hypertext, HTML, or similar environment, the selection of an item on the HTML page that is presented to the user interface **110** effects a communication of the commands that are associated with the selected item in the HTML document, for example, commands to execute a program that contains the above Basic command.

In addition to the control of appliances via the network **250**, the preferred embodiment of the control device **100**

also includes the ability to remotely control devices directly. Illustrated in FIG. **1** is an appliance **210'** that is not connected to the network **250**. The example communicator **120** of the control device **100** includes a transmitter for communicating operational commands **124** directly to the appliance **210'**. In a preferred embodiment, the transmitter is an infrared transmitter commonly used in the aforementioned universal remote controllers. Other communications means, such as a radio or wired connection would be evident to one of ordinary skill in the art. The commands and format for the communication of operational commands **124** that are associated with the particular appliance **210'** are contained in the local **140** or remote **240** information sources. In accordance with this invention, these commands are communicated to the communicator **120** when the control device **100** is brought into the vicinity of the appliance **210'**, as determined by the location parameter **131**.

Note that although the invention presented herein is particularly well suited for a user interface **110** that includes a modifiable display of information, the principles of this invention are applicable to control devices that do not have displays. For example, the control device **100** may include a variety of buttons, similar to a universal remote controller. As is common in the art, a conventional universal remote controller is programmed to control a particular brand of television, a particular brand of VCR, and so on. If a user has multiple televisions located throughout the house, of differing brands, a conventional universal controller cannot be carried from room to room and used to control each television, because the remote commands and format of a television in one room may not be the same as the remote commands and format of a television in another room. In accordance with this invention, however, as the user travels from room to room, the control device **100** will automatically receive the remote commands and format that are appropriate to the particular television in each room from the information source **140, 240**. In this manner, for example, pressing a "channel up" key on the control device **100** will effect an increment of the tuned channel on the television that is in the vicinity of the control device **100**, even though each different television throughout the house may have a different command or format for incrementing the tuned channel. That is, by storing the appropriate operational commands and formats for each option of each appliance in a local **140** or remote **240** information source, and associating the options or a subset of the options of each appliance to particular locations, the control device **100** can be reprogrammed to effect each option, in dependence upon its location.

FIG. **3** illustrates an example block diagram for a remote information source **240** in accordance with this invention. The remote information source **240** includes a receiver **242**, transmitter **244**, selector **246**, storage **248**, and an optional command processor **252** and network access device **254**. The receiver **242** receives communications **123** from the control device **100**; these communications include location information **123** a and optionally based on a user identification **123***b* and operational commands **123***c*. The selector **246** selects a subset **247** of information **249** from the storage **248**, based upon the location information **123***a*, and optionally the user identification **123***b* and other parameters such as a temporal parameter **245**. The selected information **247** is communicated to the control device **100** as context sensitive information **241**. In a preferred embodiment, the information source **240** includes a network access **254** for communicating with the network **250**. Operational commands **123***c* from the control device **100** are processed by the command processor **252** to provide control commands for appliances **210** on the network **250**, as discussed above. As would be apparent to one of ordinary skill in the art, the storage **248** may be located on the network **250** as a separate database **220**, or at one or more locations accessible via the Internet access **230** of FIG. **1**.

FIG. **4** illustrates an example flowchart for storing context sensitive information in an information source **240**. Each location area is identified in the loop **410–419**. For example, in the house **300** of FIG. **3**, areas **310–370** are identified as distinct areas, and the unique emission patterns of the signals from the emitters **301–307** corresponding to each of these areas are identified. In like manner, the association of the names of locations in the aforementioned voice recognition location determination means are associated with corresponding areas **310–370** in the loop **410–419**. Note that there need not be a direct correspondence between the number of rooms in the home and the number of emitters or names of locations. For example, some rooms may not have emitters. In this case, the absence of an identifiable emission will establish a context which, for example, only provides options to the user interface **110** to turn off the appliances in other rooms. In this manner, for example, a bedroom that has no appliances need not be configured to contain an emitter, yet the control device **100** will still have the ability to receive context sensitive information and to control appliances.

Each controllable device is then entered into the information source via the loop **420–429**. By collecting and processing the information for each controllable device, additional controllable devices can be easily added by merely repeating the steps within the loop **420–429**. The commands, or options, of the controllable device are identified at block **422**. For example, a television may have a channel up command, a channel down command, a volume up command, a volume down command, and so on. Associated with each defined command at **422** will be a sequence of data, commonly called a command string, that causes the controlled device to perform the command function; these command strings are defined at **424**.

For each location area that was defined in the loop **410–419**, the set of commands for the controllable device being processed are defined, in the loop **430–439**. Consider, for example, the aforementioned television appliance **210***a* that is located in the family room **350** of FIG. **2**. Within the family room location area **350**, full control of the television appliance **210***a* is appropriate; within the bedroom **340**, however, perhaps the only options that are appropriate are power and volume commands. Similarly, from the library area **330**, no options for control of television appliance **210***a* may be appropriate. At block **432**, the controllable device options that are to be provided at each location area are selected. Associated with each device option will be the user interface information that is provided to the user for that option, for example, the functional name of the command, or an easily recognizable symbol. The same device option may have different user interface information depending upon location area. For example, when the control device **100** is located in the family room, the user interface information associated with the power control of the television appliance **210***a* may be a simple "TV on/off" message. When the control device **100** is brought into the bedroom **240**, however, the message for the same power control of the television appliance **210***a* may be a "Fam TV on/off" message, to distinguish the television appliance **210***a* in the family room from the television appliance **210***b* in the bedroom **240**. In a graphics based system, the user interface information may also contain coordinate information for the

placement of the corresponding control area on the user interface **110**. These and other methods of communicating information for a user interface are common to one of ordinary skill in the art. Note that some of the context sensitive information need not be directly related to a controllable device option; the context sensitive information may be, for example, the status of a controllable device, without necessarily providing the user the option to effect a change in that status from different locations. Such information would be defined in block **432** and associated with a null command.

Other dependencies associated with each selected command are defined, at block **434**. Such dependencies, for example, include a definition of time periods when the selected commands of block **432** should or should not be presented to the user. In like manner, selected commands may be specified to be included or excluded from a particular user's control device, or presented differently to different users. In a preferred embodiment, sequences of actions or conditions may be specified to determine whether or not to present the selected command to the user. For example, presenting an option to turn off the bedroom television appliance **210***b* when the control device is located in the garage **370** may be dependent upon whether the device had previously been located in the entry **310**, implying a departure, rather than an arrival. As would be obvious to one of ordinary skill in the art, other presentation options, such as the order in which options appear, their format and visual attributes, and the like, may also be included in the user interface information of blocks **432** and **434**.

At **436**, the above defined and determined information is stored, using the location identifier as a locator for this information, thereby allowing for a rapid retrieval of the information appropriate to a determined location based upon a receipt of the location parameter **131** from a control device **100**. Alternative methods of storage will be evident to one of ordinary skill in the art. For example, each of the above defined interface information items may be treated as a context sensitive message having one or more associated location regions. Each time a control device **100** reports a location parameter **131**, each of the messages are checked to determine whether the location parameter **131** is within its associated location region. If the location parameter **131** is within its associated location region, the message is communicated to the control device **100**. Time dependent information items will be added or deleted from the collection of context sensitive messages based on the time of day and the conditions of the dependency defined in block **434**.

The control device **100** may be implemented in a variety of forms. Illustrated in FIG. **2** is a control device **100***b* in a kitchen **320**. The control device **100***b* may be implemented, for example, as a counter-top unit with a user interface **110** that can be viewed from a distance, and controlled via voice commands. Being informed that the control device **100***b* is in the kitchen **320**, the information source **240** provides, for example, an option to select recipes. Associated with each recipe could be an audio or video clip, allowing the user to receive instructions while preparing the meal; control options such as play, rewind, pause, and the like would be provided for such clips, using for example the aforementioned voice command input. As would be evident to one of ordinary skill in the art, additional features could also be provided, such as an interface between the recipe application and the control of an oven for preheating, automatic shutoff, and the like. Also as would be evident to one of ordinary skill in the art, for a semi-portable control device **100** such as a counter-top control device **100***b*, the location sensor **130** can be a conventional input device with which the user manually enters the location parameter **131**, such as a code that is associated with the kitchen area **320**.

In a similar manner, referring to the example illustration of FIG. **2**, a user may have a control device **100***c* in an automobile. The control device **100***c* communicates with the remote information source **240** via relay devices such as a ground **390***a* or satellite **390***b* communications system. In addition to providing location dependent information to the control device **100***c*, the information source **140**, **240** may also effect a change in the allowable mode of operation of the control device **100***c*. For example, for safety, the control device **100***c* may be automatically configured to present information using voice prompts, and receive commands from the user via voice input. The control device **100***c* may also effect a change of modality based also on whether the automobile is in gear or not, so that a user is afforded the option of a text based interface when the automobile is parked, but not while it is being driven. As would be evident to one of ordinary skill in the art, the modality may also be controlled based upon whether the user is the driver or the passenger in the vehicle.

The foregoing merely illustrates the principles of the invention. It will thus be appreciated that those skilled in the art will be able to devise various arrangements which, although not explicitly described or shown herein, embody the principles of the invention and are thus within its spirit and scope. For example, multiple information sources **240** may be provided. An information source **240** may, for example, contain a user's personal data and information, another may contain the user's business data and information, another may contain public service information, another commercial information, and so on. The user may be provided the option of selecting one or more information sources for receiving context sensitive information. For example, while driving the automobile, the user interface **110** of the control device **100***c* may present a list of restaurants in the vicinity, and selecting one from the list may effect a telephone call, facsimile, or e-mail to the restaurant to secure a reservation. In like manner, a control device **100** need not be a personal device, per se. Control devices **100** may be placed, for example, at airports and train stations. A user will log into the control device **100**, for example by providing an identification card, and the information source **240** will be informed that this user is at the location of this control device **100**. In response to the user identification and location parameters, the information source will provide the appropriate context sensitive information, for example messages related to the user's purpose of being at the airport, options to rent a car at the destination location, the status of appliances and security devices at home, and so on, and then accept commands based upon this context sensitive information.

The partitioning of functions in the example block diagram of FIG. **1** is presented for illustration purposes only. As would be evident to one of ordinary skill in the art, the functions presented can be implemented in hardware, software, or a combination of both, and may use other functional components to optimize performance. For example, the user interface **110** may be separated from the communicator **120**, and communications provided via an infrared link. In another example, the video control device **100** may be a set-top box, wherein the user interface **110** includes an interface to a television. In this embodiment, the user of this device may view the status of all the controllable appliances in the house from a distance, and control each of these appliances using a hand-held remote, or by using voice

commands. These and other configurations will be evident to one of ordinary skill in the art and well within the spirit and scope of this invention.

A further enhancement of the embodiments of the invention given above is that **210** controllable appliance is at least partly comprised in control device **100**. For example, control device **100** comprises communication software/hardware components representing, e.g., a modem. Entering different locations or zones the control device **100** switches the usage (frequency, speed, etc..) and representation of the modem. In addition control device **100** comprise both IR and RF emitters/receivers. Accordingly, based on geographic location or zone control device **100** uses different control options (IR vs RF) to control the appliances present in the location/control zone.

We claim:

1. A control system comprising:

at least one controllable appliance,

a control device having a user interface that enables a user to control the at least one controllable appliance via user commands, and

a remote information source that enables modifying a control functionality of the user interface; wherein

the control device includes a communicator that is configured to receive context sensitive information transmitted from the remote information source in response to a location parameter associated with the control device that is communicated from the control device to the information source, and

the control device is configured to modify a functionality of the user interface based on the context sensitive information.

2. The control system of claim **1**, wherein the location parameter includes at least one of a location and an orientation.

3. The control system of claim **1**, wherein

the communicator is further configured to transmit operational commands based upon the user commands and the context sensitive information.

4. The control system of claim **1**, wherein the control device further includes

a local information source, and wherein

the control functionality of the user interface is further modified based on the local information source and the location parameter.

5. The control system of claim **1**, wherein the context sensitive information is further dependent upon at least one of: a temporal parameter, a user identification, a prior location parameter and a state of an object.

6. The control system of claim **1**, wherein the control functionality of the user interface includes a control modality, and the remote information source effects a change in the control modality.

7. The control system of claim **1**, wherein

the one or more appliances include a first appliance at a first location, and a second appliance at a second location, and

the remote information source is configured to provide the context sensitive information so as to include:

controls for the first appliance when the location parameter indicates proximity to the first location, and

controls for the second appliance when the location parameter indicates proximity to the second location.

8. The control system of claim **1**, wherein the control device autonomously effects commands in dependence upon the location parameter.

9. The control system of claim **1**, wherein the control device further includes a location sensor that provides the location parameter.

10. A control device for use in a control system having one or more appliances, the control device comprising

a user interface that enables a user to control the at least one controllable appliance via user commands, and

a communicator, operably coupled to the user interface, that is configured to receive context sensitive information transmitted from a remote information source in response to a location parameter associated with the control device communicated by the control device to the information source, and

wherein the control device is configured to modify a control functionality of the user interface based on the context sensitive information.

11. The control device of claim **10**, further including

a location sensor, operably coupled to the communicator, that determines a location parameter associated with the control device.

12. The control device of claim **10**, further including

a local information source that is configured to further modify the control functionality of the user interface based on the location parameter.

13. The control device of claim **10**, wherein the context sensitive information is further dependent upon at least one of: a temporal parameter, a user identification, a prior location parameter and a state of an object.

14. The control device of claim **10**, wherein the communicator autonomously transmits default commands in dependence upon the context sensitive information.

15. An information source for use in a control system that includes a control device that is remote from the control system, and one or more appliances, the information source comprising:

a receiver that receives a location parameter from the control device,

a selector that provides context sensitive information for controlling the one or more appliances via the control device in dependence upon the location parameter, and

a transmitter that transmits the context sensitive information to the control device to enable modifying a user interface of the control device to effect a control of the one or more appliances.

16. The information source of claim **15**, wherein

the receiver also receives operational commands from the control device, and

the information source further includes

a network access device that transmits control commands to one or more appliances via a network, to effect the control of the one or more appliances based upon the operational commands from the control device.

17. The information source of claim **15**, wherein

the selector selects the context sensitive information in further dependence upon at least one of: a temporal parameter, a user identification parameter, and a state parameter.

18. A method of providing location dependent control of an appliance to a user, the method comprising the steps of:

determining a location of the user,

receiving context sensitive information from a remote information source, based on the location of the user,

providing a control functionality to the user in dependence upon the context sensitive information,

receiving a user response from the user based on the control functionality, and

communicating commands to the appliance based on the user response.

* * * * *

US006177905B1

(12) **United States Patent**
Welch

(10) **Patent No.: US 6,177,905 B1**
(45) **Date of Patent: Jan. 23, 2001**

(54) **LOCATION-TRIGGERED REMINDER FOR MOBILE USER DEVICES**

(75) Inventor: **Bryan J. Welch**, Northglenn, CO (US)

(73) Assignee: **Avaya Technology Corp.**, Miami Lakes, FL (US)

(*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

(21) Appl. No.: **09/207,882**

(22) Filed: **Dec. 8, 1998**

(51) **Int. Cl.**[7] **G01S 5/02**; H04B 7/185
(52) **U.S. Cl.** **342/357.13**; 701/208; 701/211
(58) **Field of Search** 342/357.13; 701/211, 701/208

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,470,233	*	11/1995	Fruchterman et al. .	
5,497,149	*	3/1996	Fast	340/988
5,790,974		8/1998	Tognazzini	701/204
5,848,373		12/1998	DeLorme et al.	701/200
6,064,941	*	5/2000	Nimura et al.	701/210

FOREIGN PATENT DOCUMENTS

WO 98 35311	8/1998	(EP)	G08G/1/123
0 908 835	4/1999	(EP)	G06F/17/60

OTHER PUBLICATIONS

Zeli Systems Homepage, Providing "No Hassle" GPS Solutions for Popular Computer Platforms.
U. S. Robotics, Copyright 1997, *Palm Pilot*, The Connected Organizer Handbook,—pp. ii–iii, pp. 1–22, pp. 45–63, pp. 77–85, pp. 135–150.

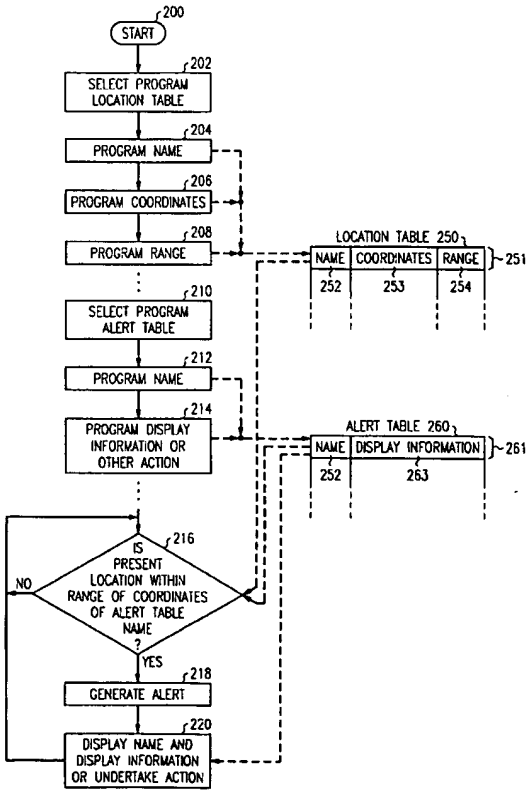
* cited by examiner

Primary Examiner—Theodore M. Blum
(74) *Attorney, Agent, or Firm*—David Volejnicek

(57) **ABSTRACT**

A mobile user device, such as a personal digital assistant (PDA **100**), a wireless telephone, a car phone, or any other programmable device that the user generally has with him or her, is equipped with a global positioning system (GPS) receiver (**101**) and is programmable (**102**) by the user to alert the user to when he or she arrives with the device at a predetermined location (**252**), as well as to disclose (**101**) to the user whatever information (**263**) the user chose to associate with that location (e.g., a "to-do" list). The user can program in the geographical coordinates (**253**) of locations and location names (**252**), and thereafter refer to the locations by name. The user can also program in a range (**254**) around each location, so that his or her arrival within that range will trigger the alert for the location.

9 Claims, 2 Drawing Sheets



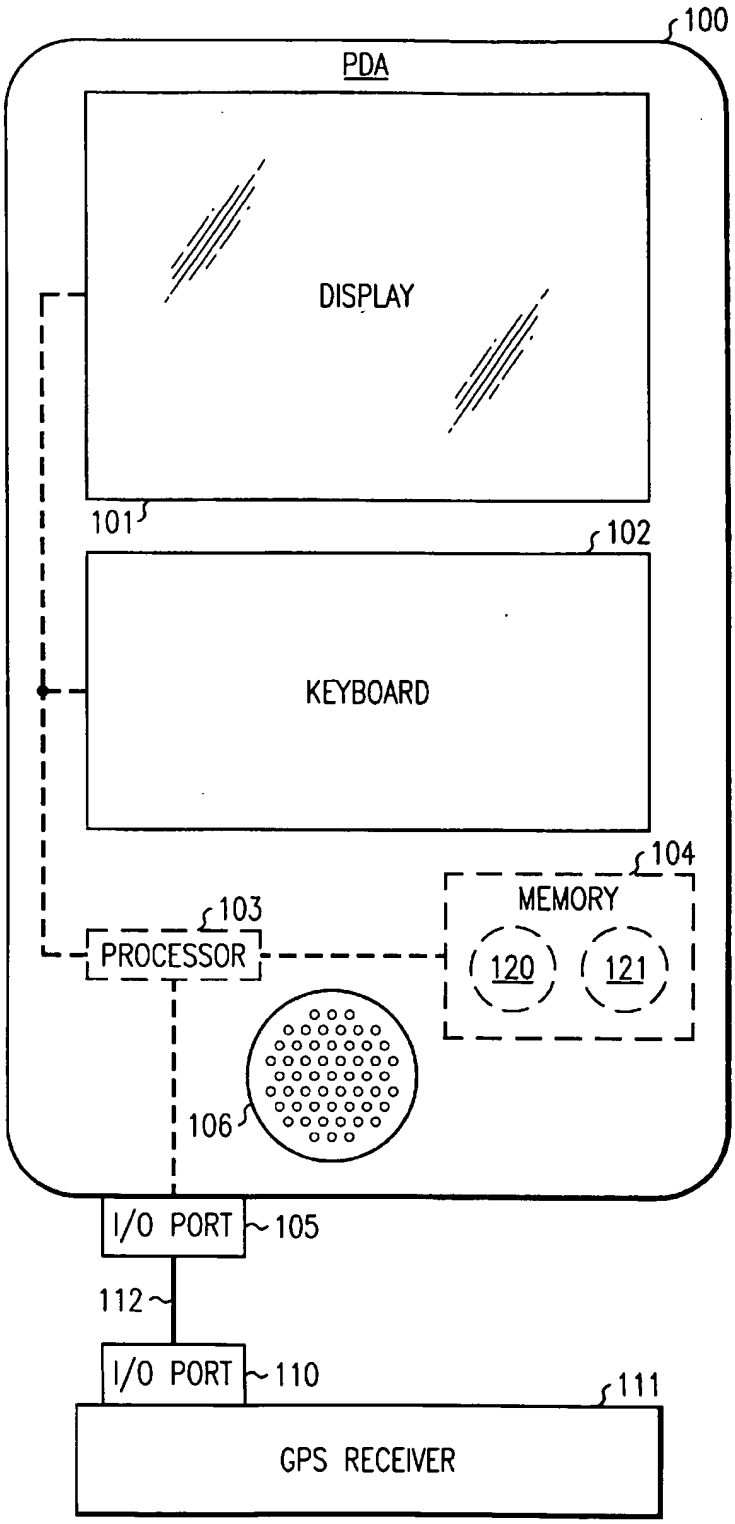
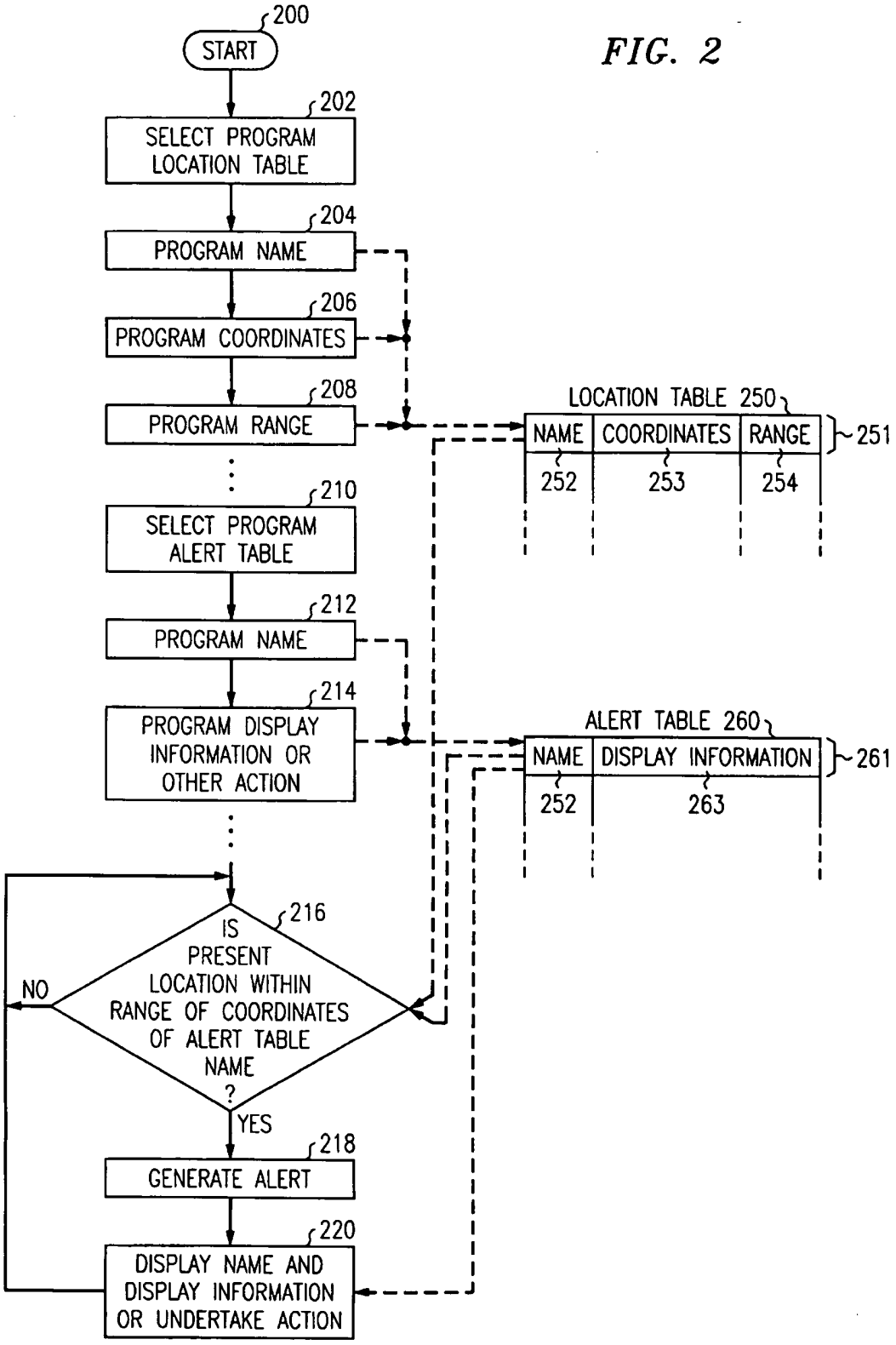

100
PDA
DISPLAY
101
102
KEYBOARD
104
MEMORY
103
PROCESSOR
120
121
106
I/O PORT
105
112
I/O PORT
110
111
GPS RECEIVER

FIG. 1

FIG. 2


200
START
202
SELECT PROGRAM LOCATION TABLE
204
PROGRAM NAME
206
PROGRAM COORDINATES
208
PROGRAM RANGE
210
SELECT PROGRAM ALERT TABLE
212
PROGRAM NAME
214
PROGRAM DISPLAY INFORMATION OR OTHER ACTION
216
IS PRESENT LOCATION WITHIN RANGE OF COORDINATES OF ALERT TABLE NAME ?
NO
YES
218
GENERATE ALERT
220
DISPLAY NAME AND DISPLAY INFORMATION OR UNDERTAKE ACTION
LOCATION TABLE 250
NAME
COORDINATES
RANGE
251
252
253
254
ALERT TABLE 260
NAME
DISPLAY INFORMATION
261
252
263

LOCATION-TRIGGERED REMINDER FOR MOBILE USER DEVICES

TECHNICAL FIELD

This invention relates to features of mobile user devices, such as personal digital assistants and wireless communications devices.

BACKGROUND OF THE INVENTION

Many things that a person has to do are associated with particular places. For example, one mails a letter at a post office or a mailbox, buys groceries at a local grocery store, and checks the condition of furnace filters at home. There is presently no easy way for a person to be reminded of something (e.g., a to-do item) when he or she arrives at a corresponding location. Hence, a person is usually required to keep the association of the action and the corresponding location at the forefront of their mind, and thus subject to be forgotten.

SUMMARY OF THE INVENTION

This invention is directed to solving these and other problems and disadvantages of the prior art. Illustratively, according to the invention, a mobile user device—such as a personal digital assistant (PDA), a wireless telephone, a car phone, or any other programmable device that the user generally has with him or her—is equipped with a global positioning system (GPS) receiver and is programmable by the user to alert the user to when he or she (along with the device) arrives at a predetermined location, as well as to disclose to the user whatever information or perform whatever action the user chose to associate with the location. Thus, for example, when the user arrives in the vicinity of the post office, the device alerts him or her that they have a letter to post; when the user is passing by the local grocery store, the device alerts him or her and displays a shopping list; and when the user arrives at home, the device alerts him or her to check the furnace filters. Consequently, the user does not have to rely on his or her memory to be reminded of desired information or actions upon his or her arrival at a particular location.

Generally according to the invention, an apparatus comprises a mobile (e.g., a portable) device that includes an information input facility and an information output facility, a global positioning system receiver connected to the mobile device for indicating to the portable device a geographical location of the mobile device, a matcher responsive to information received via the input facility specifying a geographical location and information associated therewith for repeatedly determining whether a presently-indicated said geographical location matches the specified geographical location, and a notifier responsive to the matcher's determination of a match for generating an alert and disclosing the associated information via the output facility (e.g., a display, an I/O port). Preferably, the portable device is for accompanying (e.g., being carried by) a user, the information input facility enables the user to input information, including the information associated with the geographical location and information specifying the geographical location into the device, the information output facility enables the user to receive information, including the information associated with the geographical location from the device, and the notifier generates an alert for alerting the user accompanying the device.

These and other features and advantages of the invention will become more apparent from the following description

of an illustrative embodiment of the invention considered together with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a block diagram of a mobile user device that includes an illustrative embodiment of the invention; and

FIG. 2 is a functional flow diagram of operations performed by a location-triggered reminder program of the mobile user device of FIG. 1.

DETAILED DESCRIPTION

FIG. 1 shows an illustrative mobile user device constructed according to the invention. The mobile user device is a portable device that comprises a combination of a personal digital assistant (PDA) **100** and a global positioning system (GPS) receiver **111**. PDA **100** conventionally includes a keyboard **102** for use by the user to enter information into PDA **100**, a display **101** for displaying information to the user, an alerter **106** for alerting the user, a processor **103** for controlling the operation of PDA **100** by executing stored programs, a memory **104** for storing the programs and data for use by processor **103**, and an input and output (I/O) port **105** for connecting PDA **100** to external devices. Instead of or in addition to keyboard **102** and display **101**, PDA **100** may include an audio recording facility for use by the user to enter the information, and an audio playback facility for playing back information to the user. Illustratively, PDA **100** is the Palm Pilot™ of 3Com company, and I/O port **105** is its Hot Sync port. GPS receiver **111** likewise conventionally includes an I/O port **110** for connecting GPS receiver **111** to external devices.

According to the invention, PDA **100** and GPS receiver **111** are connected **112** to each other via their I/O ports **105** and **110**, and memory **104** of PDA **100** includes a location-triggered reminder program **121**. The connection between PDA **100** and GPS receiver **111** enables GPS receiver **111** to inform PDA **100** of their location. For example, GPS receiver **111** may report their location either periodically or whenever it is polled by PDA **100**. Alternatively, PDA **100** may request GPS receiver **111** to inform it whenever they arrive at one or more locations specified by PDA **100**. Program **121** allows a user of the device to program into PDA **100** names of geographical locations and their corresponding geographical coordinates, to specify that he or she wishes to be alerted upon arrival at one or more of those geographical locations, and to associate information with those locations that he or she wishes to be reminded of.

The operation of program **121** is shown in FIG. **2**. Upon being invoked, at step **200**, program **121** gives the user a choice of programming a location table **250** or an alert table **260**. If the user selects to program location table **250**, at step **202**, program **121** allows the user to create, delete, or change an entry **251** in location table **250**. Each entry **251** comprises a name **252** of a geographical location, geographical coordinates **253** of the location, and a range **254** around coordinates **253**, e.g., within 0.1 second of latitude and longitude of coordinates **253**, or within 100 meters of coordinates **253**. The user selects and programs name **252**—e.g., "post office", "store", or "home"—via keyboard **102**, at step **204**, programs the coordinates **253**, at step **206**, illustratively by taking the device to the named location and there pressing a key of keyboard **102** that causes PDA **100** to store the coordinates presently being generated by GPS receiver **111**, and programs range **254** via keyboard **102**, at step **208**.

If and when the user selects to program alert table **260**, at step **210**, program **121** allows the user to create, delete, or

change an entry **261** in alert table **260**. Each entry **261** comprises a name **252** of a geographical location from an entry **251** of location table **250** and display information **263**. Display information **263** is information that the user wants to be reminded of upon arrival at the named location. Besides information for displaying on display **101** of PDA **100**, it may include other information such as an indication (e.g., a program) of action that the user wants PDA **100** to undertake upon arrival at the named location. The user may program either the display information itself or a pointer to where the information may be found. For example, PDA **100** may include a grocery list program **120**, and the user may point display information field **263** to display the grocery list of program **120**. The user selects and programs name **252** via keyboard **102**, at step **212**, and programs display and/or action information **263** via keyboard **102**, at step **214**.

When alert table **260** is not empty, program **121** cooperates with GPS receiver **111** to determine if their present geographical location is within range **254** of coordinates **253** of any location whose name **252** appears in alert table **260**, at step **216**. When they arrive within the range of one of those named locations, PDA **100** generates an alert via alerter **106**, at step **218**—for example, by emitting an alarm sound, or by vibrating—and displays on display **101** whatever information is specified by display information **263** of that named location's entry **201**. Program **121** then returns to step **216**.

Of course, various changes and modifications to the illustrative embodiment described above will be apparent to those skilled in the art. For example, the alert can take many different forms, including sounding a buzzer, flashing a light on the dashboard of an automobile, on a cell phone, or on a screen of a laptop computer, or making a phone call to a predetermined number. Also, instead of or in addition to displaying information associated with a location, other actions may be taken, including sending signals on the I/O port to other devices such as personal computers or an automobile. Such changes and modifications can be made without departing from the spirit and the scope of the invention and without diminishing its attendant advantages. It is therefore intended that such changes and modifications be covered by the following claims except insofar as limited by the prior art.

What is claimed is:

1. An apparatus comprising:

a mobile device for accompanying a user of the mobile device and including an information input facility and an information output facility;

a position receiver for indicating a geographical location of the mobile device;

a matcher cooperative with the information input facility and the receiver, responsive to information received from the user via the input facility specifying a geographical location and a geographical range around the geographical location in association with a name corresponding to the geographical location, and separately specifying the name in association with user information that the user wants to associate with the geographical location, for repeatedly determining whether a presently indicated said geographical location of the mobile device matches within a specified said geographical range a specified said geographic location that is associated with a specified said name that has specified said user information associated therewith; and

a notifier cooperative with the matcher and the information output facility, responsive only to a determination of said match, for generating an alert for alerting the user and disclosing said specified user information to the user via the output facility.

2. The apparatus of claim **1** wherein:

the mobile device is one of a personal digital assistant, a portable computer, and a wireless communications terminal.

3. The apparatus of claim **1** further comprising:

a first information store cooperative with the information input facility, responsive to receipt of the name for storing the received name in association with one of (a) a presently-indicated said geographical location of the mobile device, and (b) a geographical location specified by the information received via the information input facility; and

a second information store cooperative with the information input facility, responsive to receipt of the name and the user information associated therewith, for storing the received name in association with the user information associated therewith; and

the matcher is cooperative with the first and the second information stores, for repeatedly determining whether the presently-indicated geographical location of the mobile device matches within the specified range any said location stored by the first information store in association with any said name that is also stored by the second information store in association with any said user information.

4. The apparatus of claim **3** wherein:

the information received and stored by the first information store in association with the name further specifies the geographical range corresponding to the name;

the matcher is responsive to the range, for repeatedly determining whether the presently-indicated geographical location of the mobile device lies within the stored range of the location stored by the first information store in association with any said name that is also stored by the second information store in association with any said user information.

5. A method comprising:

receiving, in a mobile device for accompanying a user of the mobile device, information indicating a present geographical location of the mobile device;

receiving from the user, in the mobile device, information specifying a geographical location and a geographical range around the geographical location in association with a name corresponding to the geographical location;

receiving from the user, in the mobile device, information specifying the name in association with user information that the user wants to associate with the geographical location;

in response, repeatedly determining whether a presently-indicated said present geographical location of the mobile device matches within a specified said geographical range a specified said geographical location that is associated with a specified said name that has specified said user information associated therewith;

in response to a determination of a match, generating an alert for alerting the user; and

further in response to the determination of the match, disclosing said specified user information to the user.

6. The method of claim **5** wherein:

receiving information specifying a geographical location and information associated therewith comprises

firstly receiving the name from the user,

in response storing the firstly-received name in association with one of (a) a presently-indicated said present geographical location of the mobile device, and (b) a geographical location specified by the information received from the user,

secondly receiving the name and the user information associated therewith from the user,

in response, separately storing the secondly-received name in association with the user information associated therewith; and

repeatedly determining comprises

repeatedly determining whether the presently-indicated present geographical location of the mobile device matches within the specified-range any said location stored in association with any said name that is also separately stored in association with any said user information.

7. The method of claim 6 wherein:

secondly receiving further includes

receiving information specifying the geographical range corresponding to the stored location, and

in response storing the received range in association with the firstly-received name; and

repeatedly determining whether the presently-indicated present geographical location of the mobile device matches within the specified-range any said location stored in association with any said name that is separately stored in association with any said information comprises

repeatedly determining whether the presently-indicated present geographical location of the mobile device lies within the stored range of the location stored in association with said any said name that is also separately stored in association with any said user information.

8. An apparatus that performs the method of claim 5 or 6 or 7.

9. A computer-readable medium containing software which, when executed in a computer, causes the computer to perform the method of claim 5 or 6 or 7.

* * * * *

US006731940B1

(12) **United States Patent**
Nagendran

(10) **Patent No.: US 6,731,940 B1**
(45) **Date of Patent: May 4, 2004**

(54) **METHODS OF USING WIRELESS GEOLOCATION TO CUSTOMIZE CONTENT AND DELIVERY OF INFORMATION TO WIRELESS COMMUNICATION DEVICES**

(75) Inventor: **Uday Nagendran**, Milpitas, CA (US)

(73) Assignees: **Trafficmaster USA, Inc.**, Wilington, DE (US); **Motorola, Inc.**, Schaumburg, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/561,319**

(22) Filed: **Apr. 28, 2000**

(51) **Int. Cl.**[7] **H04Q 7/20**
(52) **U.S. Cl.** **455/456.1**; 455/456.5
(58) **Field of Search** 455/456, 457, 455/450, 562, 456.1, 456.2, 456.5, 464; 340/905

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,396,429	A *	3/1995	Hanchett	340/910
5,432,542	A	7/1995	Thibadeau et al.	348/6
5,493,709	A	2/1996	Duckect et al.	455/185.1
5,548,586	A	8/1996	Kito et al.	370/60
5,565,909	A	10/1996	Thibadeau et al.	348/9
5,625,668	A *	4/1997	Loomis et al.	342/357.1
5,627,549	A	5/1997	Park	342/357
5,636,245	A	6/1997	Ernst et al.	375/259
5,684,859	A	11/1997	Chanroo et al.	379/58
5,818,385	A *	10/1998	Bartholomew	342/372
5,898,680	A	4/1999	Johnstone et al.	370/316
5,900,825	A	5/1999	Pressel et al.	340/905
6,018,317	A *	1/2000	Dogan et al.	342/378
6,026,304	A *	2/2000	Hilsenrath et al.	455/456.2
6,064,339	A *	5/2000	Wax et al.	342/417
6,084,546	A *	7/2000	Wax et al.	342/378
6,108,533	A *	8/2000	Brohoff	455/414
6,112,095	A *	8/2000	Wax et al.	455/456
6,115,611	A *	9/2000	Kimoto et al.	455/422
6,236,365	B1 *	5/2001	LeBlanc et al.	342/457
6,249,252	B1 *	6/2001	Dupray	342/357.01
6,249,680	B1 *	6/2001	Wax et al.	455/456
6,288,675	B1 *	9/2001	Maloney	342/457
6,397,082	B1 *	5/2002	Searle	455/434
6,404,750	B1 *	6/2002	Wicker et al.	370/329
6,505,046	B1 *	1/2003	Baker	455/456.3

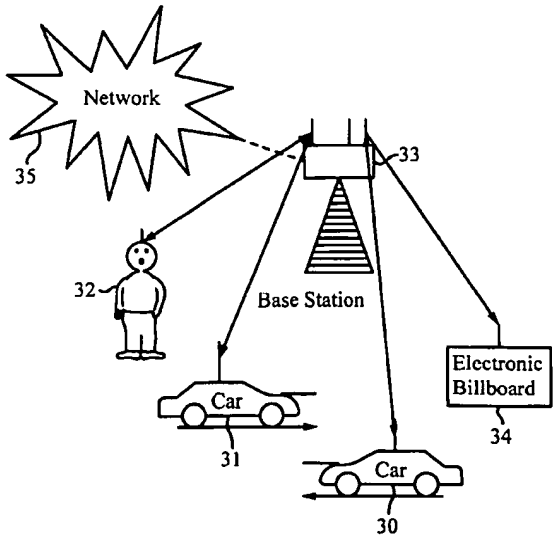
* cited by examiner

Primary Examiner—Nay Maung
Assistant Examiner—Tan Trinh
(74) *Attorney, Agent, or Firm*—Townsend and Townsend and Crew LLP

(57) **ABSTRACT**

The present invention provides a method for finding the location of a mobile device user, and using the location to customize the information and to determine the way of delivering such information to the user. The mobile device user may request the information either with an interactive series of one or more requests, or by pre-selecting the type of message to be delivered. The customized information is transmitted only to the mobile device from which the request is originated. It can also be displayed at a public display unit (such as an electronic billboard), sent to a public broadcaster, posted on the Internet, or sent to a fax machine or a modem. The present invention also provides a method for determining traffic density and speed information that can be continuously updated. The traffic information together with a variety of traffic services can be transmitted to mobile devices users, displayed at inanimate devices (such as electronic billboards), publicly boradcasted, or posted on the Internet.

35 Claims, 4 Drawing Sheets



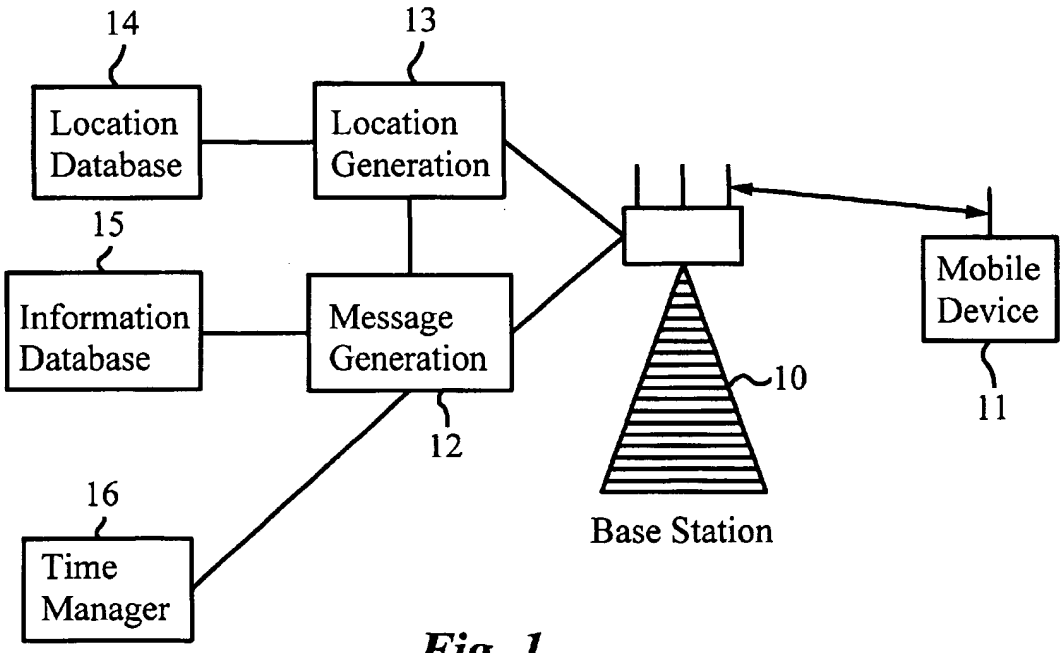

14
13
Location Database
Location Generation
15
Information Database
Message Generation
12
16
Time Manager
10
Base Station
Mobile Device
11

Fig. 1

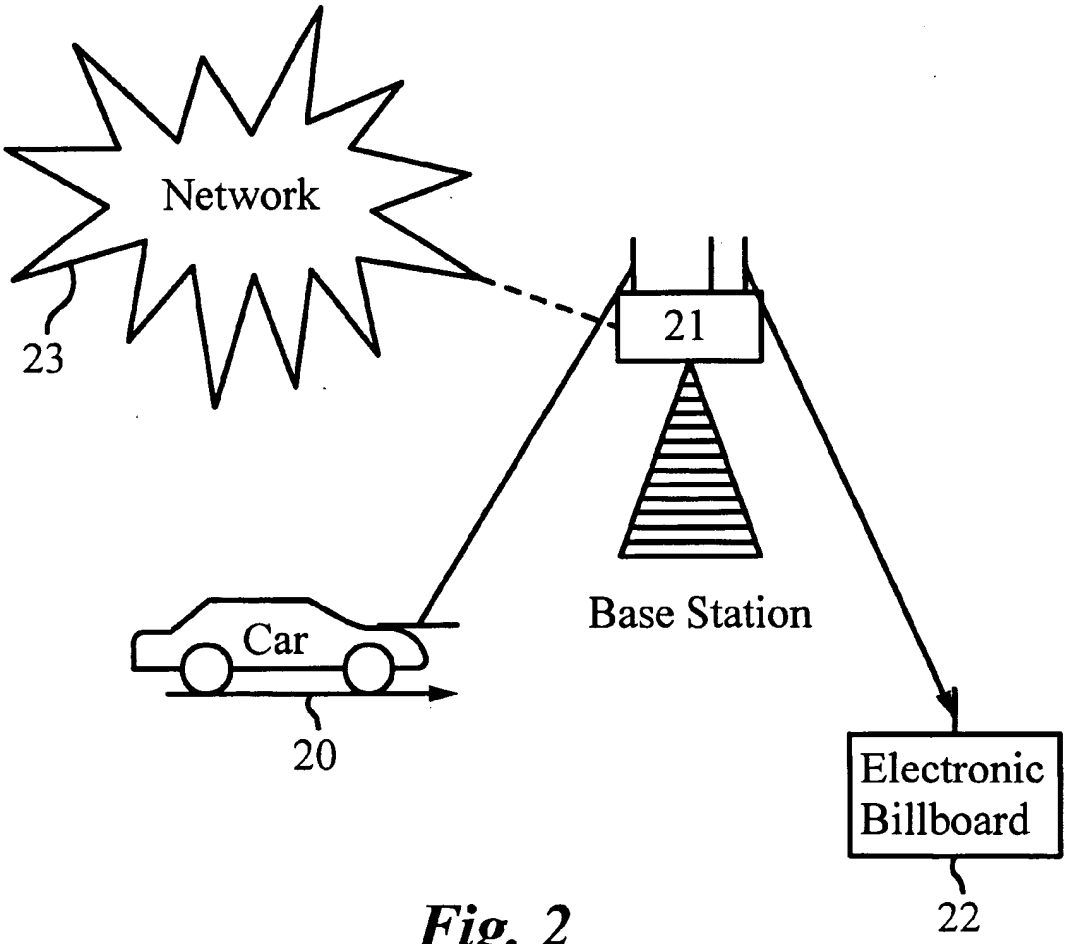


Fig. 2

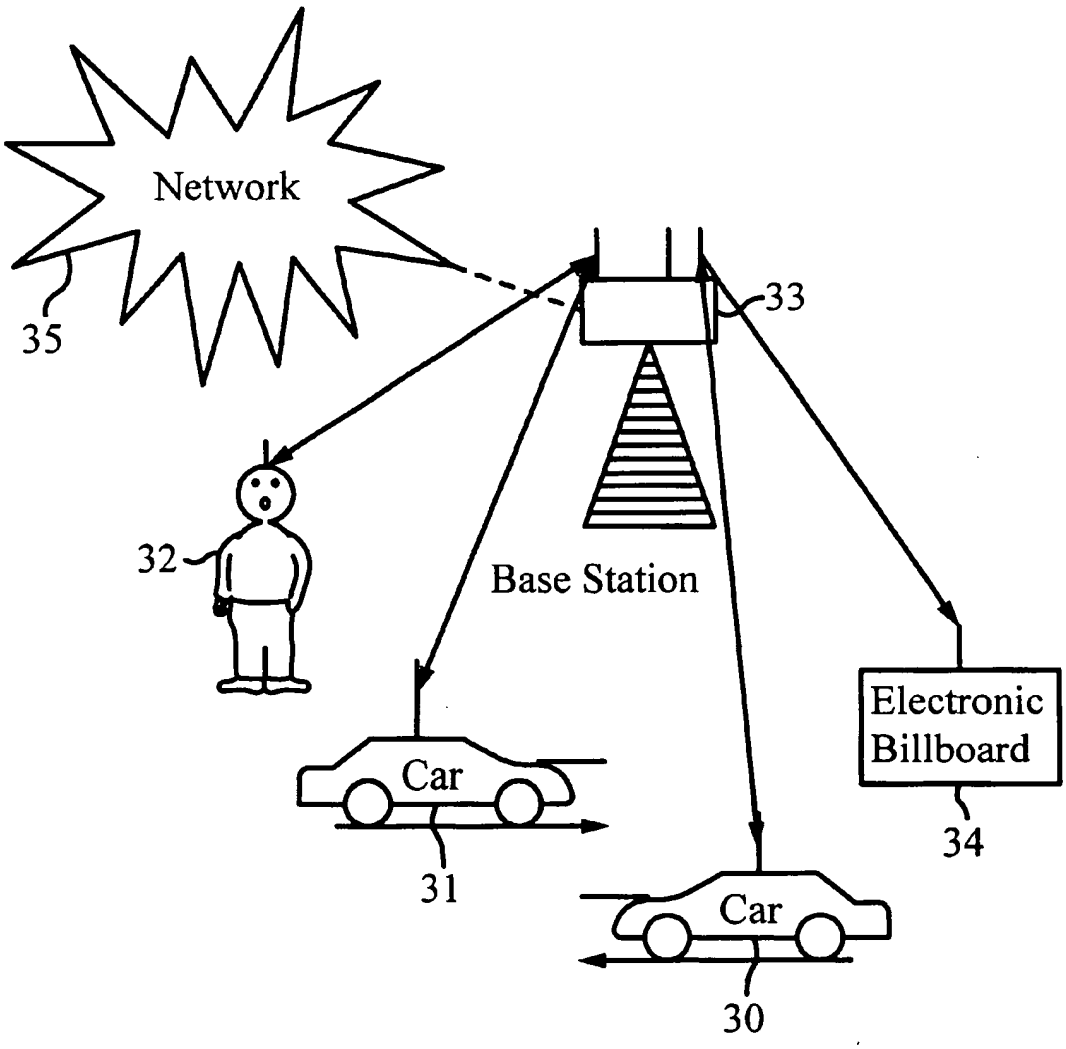

Network
35
33
32
Base Station
Electronic
Billboard
34
Car
31
Car
30

Fig. 3

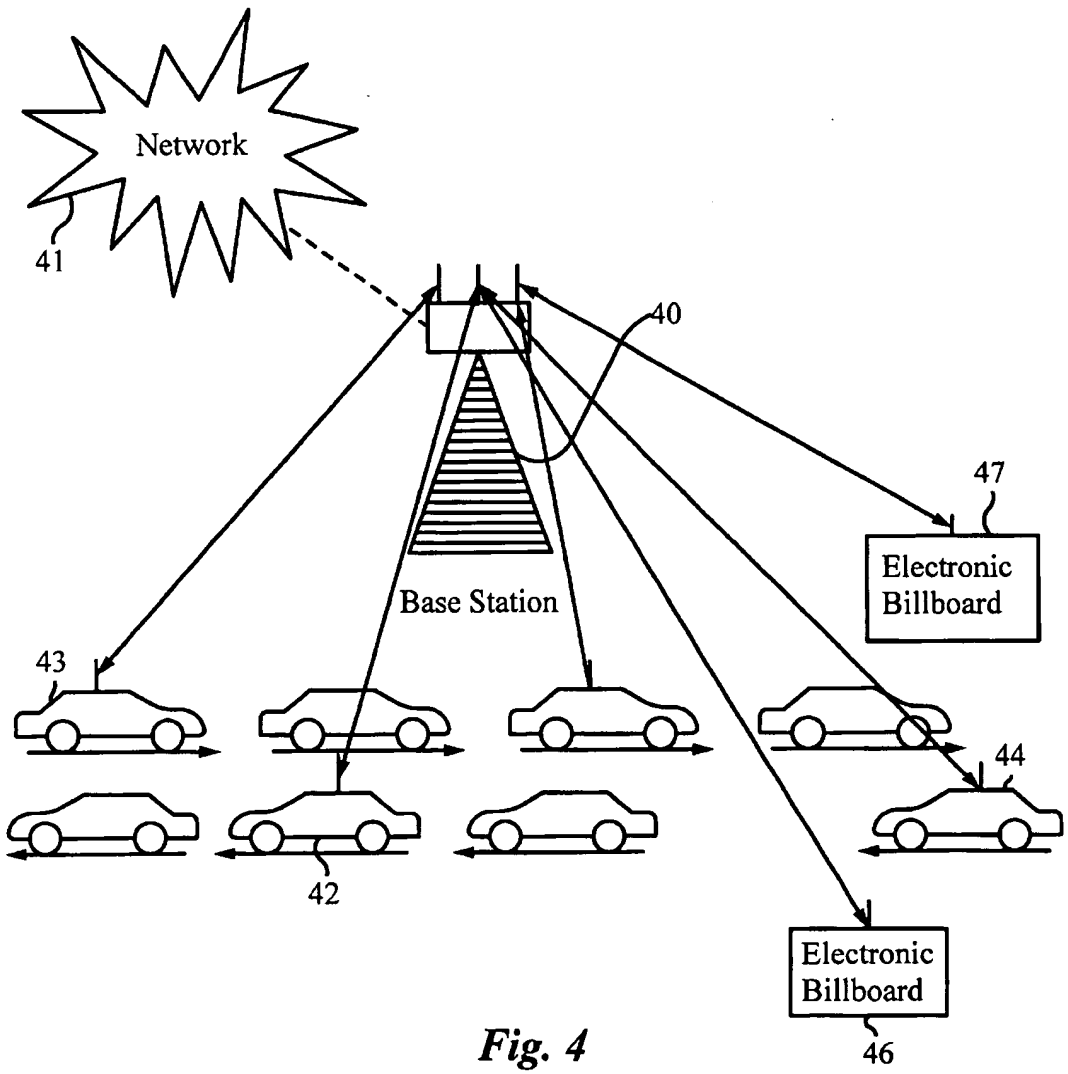

Network
41
40
47
Electronic Billboard
Base Station
43
44
42
Electronic Billboard
46

Fig. 4

METHODS OF USING WIRELESS GEOLOCATION TO CUSTOMIZE CONTENT AND DELIVERY OF INFORMATION TO WIRELESS COMMUNICATION DEVICES

FIELD OF THE INVENTION

This invention relates generally to wireless communications systems. More particularly, it relates to providing location-based information to mobile communication devices.

BACKGROUND ART

As wireless communications rapidly spread into every walk of modern life and approach a state of ubiquity, the demand for the bandwidth (or content) of information transmission in wireless communications networks is also growing. A great deal of effort has been devoted to providing location-specific information to mobile device users in a timely, accurate, interactive, and customized manner, that in turn reduces the bandwidth need and required user interaction.

U.S. Pat. No. 5,636,245, for example, describes a method for determining whether access to particular information transmitted by a broadcaster is appropriate for a particular remote unit (such as a mobile device). The method is particularly useful for distributing situation awareness information. U.S. Pat. No. 5,493,709 discloses a radio receiver using current frequency and coordinate data transmitted by a mobile device as a basis for selecting traffic message pertinent to the user of the device, such that traffic data are automatically selected without requiring traveler's input. U.S. Pat. No. 5,548,586 discloses a mobile packet communication system and method which are capable of transmitting packet data only to a selected base station in whose service cell a mobile device requesting the data is operating, without transmitting the data to all base stations in the same area. U.S. Pat. No. 5,684,859 discloses a system for providing paging information to roaming subscribers in a convenient and efficient manner to make the change of geographic area as seamless as possible. U.S. Pat. No. 5,898,680 describes a system and method for distributing data (particularly map data and other types of image data) to users by means of a radio frequency link, so that up-to-date data can be obtained as frequently as needed. (In this case, although remote users can obtain data selectively, there is no two-way communication between the users and the source of the data.) U.S. Pat. No. 5,900,825 describes a system and method for providing information to an operator of a vehicle. It requires, however, the vehicle to be equipped with a position determining means (using GPS or signals received from a local transmitter site, for example) and compares the position of the vehicle to the location indicated by each message. When a match is found, the receiver system provides the matching message to the operator. U.S. Pat. No. 5,627,549 describes a system and method for sending specific time and location sensitive advertising information to a moving vehicle. There have also been other efforts on transmitting messages targeted to a specific geographical group of mobile device users, as exemplified by U.S. Pat. Nos. 5,565,909 and 5,432,542.

With prior art systems, the users of mobile communication devices are not allowed to communicate with their respective information service networks in an interactive and personalized manner to tailor information received in the context of their location for example. That is, the information is generic and broadcast to a group of users in the same geographical region, rather than being tailored and targeted to a particular user. Moreover, some of the prior art systems require a third party device, such as a GPS unit, to facilitate generating and delivering the location information.

What is needed in the art, therefore, are innovative ways of delivering accurate location-specific information to mobile device users in an interactive, user-tailored and multimedia fashion without requiring the user's mobile device to have inherent location capability.

SUMMARY

The present invention provides a method for using the RF signal characteristics, or information derived therefrom, of the receiving wireless device to customize the delivery and or content of information to the receiving wireless device, for one or more wireless devices, including, but not limited to, mobile wireless communication devices. In addition, information can be customized by criteria selected by the wireless device user, the information content provider, or the information broadcaster. Customization of information can include generating, modifying, and/or deleting the information content, and regulating the delivery of information content to the mobile device so as to optimize the usage of capacity and decrease the burden on the user.

Information that can be transmitted to wireless devices may reside in a remote database. Information can be content for delivery to wireless devices and criteria to regulate that delivery. Information content can be generic, location and/or velocity centric, and location and/or velocity modified generic data. Examples of generic content are: product promotions, facility usage directions, neighborhood yard sales and events, road and civil construction, and area map information.

Examples of location and/or velocity based content are: mobile device current location, average traffic speed on current or alternate roadway sections, traffic alerts of congested or slow-speed areas, and current directional bearing of travel. An example of location and/or velocity-modified generic content is: dating service based on proximity of wireless device users.

In addition, delivery criteria may be associated with the information content, and can be used to regulate the transmission of the information content. Delivery criteria can be related to the content-provider, the user, and/or the broadcast service provider.

Delivery criteria provided by the information content provider can include, but is not limited to time and duration criteria. Examples of time criteria may include store operation hours associated with particular information content, and time periods associated with scheduled road maintenance. Examples of duration criteria may include the amount of time after content posting to transmit content associated with promotional details in the content, or the amount of time after transmission of the content that the content is valid for, and/or other time-sensitive matters related to the content.

User related delivery criteria may be related to location and personal preferences of the user. Location-related criteria may include, but is not limited to location information, and/or mobile device movement information such as distance, speed, and/or bearing. Examples of location information criteria may include the location of stores selling a product contained in the information content, the location of a traffic accident, or the road containing a traffic accident. Examples of mobile device distance information may

include the maximum distance between a mobile device and a store contained in the information content, or the maximum distance between a mobile device and a public danger, such as a traffic incident that may be blocking an exit. An example of mobile device speed information may include a speed range that traffic is moving on a road or highway and information content suitable for highway travelers who may be benefited by the knowledge of that information. An example of mobile device direction information may include information content that can be sent when a receiver is less than a first maximum distance away and conditionally sent if the receiver is less than a second, greater maximum distance and the receiver direction is towards the location associated with the information content.

A mobile device user can provide user-related criteria to information providers or information broadcasters by requesting location-specific information either with an interactive series of one or more requests, or by pre-selecting the type of message to be delivered. Pre-selected conditions for a message may include, time, location, radial distance, commercial services, advertising information, pricing information, traffic conditions or events, and public safety and emergency announcements, to name but a few.

Location of a mobile device is determined using at least one location determining base station site. Information meeting the pre-selected conditions is then transmitted to the mobile device from which a request originated or which was preselected by the user, without imposing any special requirement on the user's device, or involving a third party (e.g., GPS, or a plurality of base stations). Location-specific information that is time sensitive also can be delivered in real-time or close to real-time. Moreover, location-specific information alternatively can be displayed at a public display unit (such as an electronic billboard), posted on the Internet, or sent to a fax machine, printer, variable message sign, local range radio or a modem. By application of this capability, the present invention also enables an information service network to generate and deliver location-specific information tailored to a plurality of mobile device users.

In accordance with one embodiment of the present invention, an antenna array at a base station receiver of an information service network receives direct path and multipath signals transmitted from a mobile device. The base station determines one or more signal signatures from a subspace of array covariance matrices derived from the received signals. The signature then is compared to a database of calibrated signal signatures and corresponding locations, and a location , which has a calibrated signature best matches the measured signature is selected as the most likely location of the mobile device. In accordance with one embodiment of the present invention, the database of calibrated signal signatures and corresponding locations is generated by a calibration procedure in which a calibration mobile device transmits location data derived from a GPS system to the base station which records the location information together with the signal signature of the calibration device. A more detailed description of this method is given in U.S. Pat. No. No. 6,026,304 issued on Feb. 15, 2000 to Hilsenrath et. al., the entirety of which is incorporated by reference for all purposes.

Knowing the location of the mobile device in an accurate and timely fashion allows the information service network to determine the information that the mobile device user is interested in, and consequently delivers the pertinent information in a timely fashion. The information service network may provide further information to the user in an interactive and user-tailored fashion, or update the information on a regular or a pre-scheduled basis.

In accordance with another aspect of the above location finding method is that it needs only a single base station, in contrast to multiple base stations employed in the prior art methods. Moreover, it does not impose any specific requirement on the mobile device, therefore allowing the wireless network to support all types of mobile devices currently deployed.

Further, the method does not impose a requirement on the mobile device to be communicating with the location network at the time of location determination.

Using a location-finding method of the present invention, traffic density and speed information readily can be generated and continuously updated. Accordingly, real-time traffic information and services, commercial services, and public safety and emergency announcements can be transmitted to mobile device users, displayed at passive display devices (such as electronic billboards) placed in one or more designated areas, or a combination of both. Such information also can be broadcast publicly, posted privately on the Internet, or sent to fax machines or modems.

Furthermore, merchants and information kiosk users can benefit from the ability to send and/or receive location-specific information of interest, such as targeted advertisements and special services, to travelers and shoppers.

The novel features of this invention, as well as the invention itself, will be best understood from the following drawings and detailed description.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** depicts one embodiment of a method of the present invention for generating and delivering location-specific information to a mobile communication device;

FIG. **2** shows another embodiment of the present invention for generating and delivering location-specific information to an inanimate device;

FIG. **3** depicts yet another embodiment of the present invention for generating and delivering location-specific information tailored to a plurality of mobile communication device users.

FIG. **4** shows an exemplary embodiment of the present invention for determining traffic density and speed on a roadway.

DETAILED DESCRIPTION

Although the following detailed description contains many specifics for the purposes of illustration, anyone of ordinary skill in the art will appreciate that many variations and alterations to the following details are within the scope of the invention. Accordingly, the following preferred embodiment of the invention is set forth without any loss of generality to, and without imposing limitations upon, the claimed invention.

The present invention employs systems and methods for accurately determining the location of mobile devices using a single base station. More specifically, signals transmitted by a mobile device are detected by an antenna array at a base station that is part of an information service network (e.g., a cellular telephone network Based upon the signals received, the base station determines a signal signature, which can be a subspace of an array covariance matrix constructed from a set of p-dimensional array vectors derived from the received signals. In general, the signal signature is any location-dependent feature derived from the set of direct and multipath signals received at the antenna array of the base station transmitted from a given location.

The signature may be derived from any combination of amplitude, phase, delay, direction, and polarization information of the signals.

Preferably, the signature is substantially invariant with respect to all variables unrelated to the location of interest, such as noise. A more detailed description of this method is given in U.S. Pat. No. 6,026,304, issued on Feb. 15, 2000 to Hilsenrath et. al., the entirety of which is incorporated by reference for all purposes.

After the signal signature has been determined, it is then compared to a database of calibrated signal signatures and corresponding locations. The database of calibrated signal signatures and corresponding locations can be generated by a calibration procedure in which GPS location data of a calibration mobile unit is associated with the signal signature of the calibration mobile unit received at the base station. By searching such a database, a location which has a calibrated signature associated with it that best matches the measured signature is selected as the most likely location of the mobile device. The entire location finding process takes place within seconds, fractions of seconds or near real-time.

A feature that distinguishes this method of location finding from the prior methods is that it can accurately determine a location from a single base station, in contrast to multiple base stations employed in the prior art. A further aspect of this method of location finding is that it can determine the position of any mobile device, not limited to those subscribing to a given information service network or currently communicating with the location network.

FIG. 1 depicts one embodiment of the present invention for generating and delivering location-specific information to a mobile device user. A single site base station **10**, equipped to receive signals with an antenna array, receives a request for information from a mobile device **11**. The request is then forwarded to a message generator **12**. Both the base station **10** and the message generator **12** are connected to a location generator **13**, which, in turn, is connected to a location database **14**. The location generator **13** determines location information from the received signals by using, for example, the location finding method describe above, and sends the location information so obtained back to the message generator **12**. The message generator **12** then compiles the location information with other information pertinent to the specific location of interest, which comes from an information database **15**. (The information database is assumed to be a part of the information service network hereinafter, although it can also be an external information service provider with which the network is in communication.) A time manager **16** also may provide an input to the message generator, if time sensitive issues are involved. The compiled message comprising requested location-specific information is then sent from the message generator **12** to the base station **10**, and subsequently transmitted to the mobile device **11** by the base station **10**.

Upon receiving the location-specific information, the mobile device user may send one or more follow-up requests to express certain preferences (for a gas station, a restaurant, or a shopping center, for instance), or require additional information. The information service network will respond accordingly. There can be a sequence of back-and-forth communications between the mobile device user and the network.

The information requested by the mobile device user also can be transmitted to a public display unit, such as an electronic billboard, as depicted in FIG. **2**. In accordance with this exemplary embodiment, a motorist **20** on a roadway sends a request for information (for example, the location of the nearest gas station) to a base station **21** of an information service network **23**. The base station is also in communication with an electronic billboard **22** placed along the traveling path of the motorist. The base station **21** transmits the requested information, or information deemed appropriate by the network, to the electronic billboard **22**, to be viewed by the motorist. (The base station may or may not notify the motorist about the location of the message being displayed.)

Moreover, a mobile device user can request information to be delivered in a pre-selected and pre-scheduled manner. For example, a user may request a message to be displayed on a billboard placed on a specific roadway on a specific day, so that a target user will be greeted with the message when driving past the sign on that day. A traveling sales person may want information about local weather, food and lodging services to be delivered to him/her through a mobile device (or a public display unit placed at an airport, or train station) upon arriving in each city on his/her journey. Such information also can be made available on the Internet, or sent to the person's fax machine or modem.

FIG. **3** shows another embodiment of the present invention. A plurality of mobile device users, including motorists **30** and **31** and a pedestrian **32**, send information requests to a base station **33** of an information service network **35**. The nature and content of information requested may vary from one user to another. For example, the motorist **30** may request for the location of the nearest gas station; the motorist **31** may inquire about the location of the nearest shopping mall; whereas the pedestrian **32** may want to know the location of the nearest restaurant. These information requests are processed at the network, and the replies to these requests are subsequently directed to the respective mobile users by the base station **33**. One or more replies can also be displayed at a designated public display unit **34**. The replies to information requests may be in the form of text messages, interactive voice responses, a voice from a live operator, or any other means of replying to such requests and displaying responses.

The present invention also provides a method for determining traffic density and speed on roadways, as illustrated in FIG. **4**. A base station **40** of an information service network **41** receives signals from a plurality of mobile device users, such as users **42**, **43**, **44**, and **45**, traveling in a roadway segment. By determining the locations of these users, the information service network can provide an estimate of the density of travelers in the segment of interest. Moreover, by continuously sampling the signals transmitted by the users on the roadway at certain time intervals, the network can derive an estimate of the speed of traffic in the segment of interest. The traffic density and speed information thus obtained is stored in a traffic database at the network. The information service network can send such traffic information to mobile device users on the roadway upon request, or display the traffic information at one or more public display units, such as units **46** and **47** along the roadway that can be continuously updated. In addition, the traffic information can be forwarded to a central database where information can be compiled, archived and otherwise stored for later retrieval.

The information service network can compile an extended traffic database by sampling traffic densities and speeds in different segments of a roadway and on various roadways in a specific geographical area. Using this information, the information service network can offer a variety of traffic

services to mobile device users traveling in the area accordingly. For instance, it can alert the users of traffic congestion or other hazardous conditions occurring in a particular roadway segment upon request or on a pre-scheduled basis, and suggest alternative routes to those who may have intended to travel to the problematic segment. It also can diligently monitor the users who are approaching the problematic segment and automatically send out traffic avoidance messages. Moreover, the traffic database generated at the network can be shared with traffic controllers, public broadcasters (e.g., television and radio broadcasters), or posted on the Internet, so to inform the public at large. Traffic engineers can use the traffic database to study the correlation between one congested segment and others, so to provide more effective travel planning services. In addition, public safety and emergency announcements, commercial advertising information, and many other services can also be made available to mobile device users. In all cases, the present invention enables the delivery of these services to be timely, effective, comprehensive and seamless.

The method of the present invention for generating and delivering traffic information, commercials, information and corresponding services is not limited to roadway traffic. It also can be applied to pedestrian traffic, air traffic, marine traffic, ski traffic, delivery fleets, commercial vehicle operators and many other types of traffic. Moreover, the method of the present invention can be used to monitor demographic pattern and behavior.

An instance of such a pattern might be the observation of traffic flow whether vehicular or pedestrian. Such information may be used to determine the routes most commonly taken. This information can act as the basis of planning studies, marketing plans and positions of public messages. It also can be used by the operators of cellular and other wireless networks to deploy capacity sites or reposition existing assets to maximize the usage of those assets. Such planning is typically performed by labor intensive and expensive processes, which may now be easily automated.

Expand to fleet management. It is another purpose of the invention to deliver route information to a mobile device after the mobile device user has provided at least a destination location. While additional information can be provided by the user, this is not required for essential route information delivery. The system would determine the current location of the mobile device user. Static information about route paths in the area would then be consulted. The route delivery service would then determine the most optimal route based on length of paths available; RF signal characteristics and information derived therefrom, from transmitting mobile wireless devices in the area, that includes but is not limited to: traffic density and speed on sections of paths; and optionally on user-selected criteria. After delivery of optimal route information, the service could then re-determine the optimal route at intervals, or as conditions change, during the user's progress.

It is also apparent to those skilled in the art that the exemplary embodiments described above may be altered in many ways without departing from the principle and the scope of the invention; and numerous embodiments can be further derived from the present invention. Accordingly, the scope of the invention should be determined by the following claims and their legal equivalents.

What is claimed is:

1. In a wireless communications system comprising an RF receiving site and a mobile device operated by a user, wherein said RF receiving site includes an antenna array, a method of providing customized information related to said user, comprising the steps of:

a) receiving at said antenna array one or more RF signals originating from said mobile device;

b) deriving at least one p-dimensional array vectors from said one or more RF signals sampled from p antennas of said array;

c) using said at least one p-dimensional array vectors to derive a location of said mobile device;

d) using said location to determine said customized information; and

e) using said location to select a means to transmit said customized information to an information user.

2. The method of claim 1 further comprising the steps of:

a) deriving a velocity of said mobile device from said one or more RF signals originating from said mobile device;

b) using said velocity to determine said customized information; and

c) using said velocity to select a means to transmit said customized information to said information user.

3. The method of claim 1 wherein said information user is said user.

4. The method of claim 1 wherein said information user is an external network.

5. The method of claim 1 wherein said mobile device is a transmitter-receiver, and wherein said customized information is transmitted exclusively to said transmitter-receiver.

6. The method of claim 1 wherein said customized information is transmitted exclusively to a remote receiver.

7. The method of claim 6 wherein said remote receiver is connected to a public display unit, such that said customized information is displayed on said public display unit accessible to said mobile user.

8. The method of claim 7 wherein said public display unit is selected from the group consisting of: an electronic billboard, a display screen at a service station, and a kiosk equipped with wireless reception capability.

9. The method of claim 1 wherein said customized information is transmitted to a broadcaster selected from the group consisting of: a television broadcaster and a radio broadcaster.

10. The method of claim 1 wherein said customized information is transmitted to a data receptacle selected from the group consisting of: an internet web site, an electronic mail account, a pager, a mobile phone, a modem, and a fax machine.

11. The method of claim 1 wherein said customized information includes a location of a service provider in a vicinity of said location of said mobile device.

12. The method of claim 1 wherein said customized information includes traffic conditions in a vicinity of said location of said mobile device.

13. The method of claim 1 wherein said customized information includes service information in a vicinity of said location of said mobile device.

14. The method of claim 13 wherein said service information includes commercial services, advertising information, traffic conditions, public safety and emergency announcements.

15. In a wireless communications system comprising an RF receiving site and a mobile device operated by a user, wherein said RF receiving site includes an antenna array, a method of providing customized information related to said user, comprising the steps of:

a) receiving at said antenna array one or more RF signals originating from said mobile device;

b) deriving at least one p-dimensional array vectors from said one or more RF signals sampled from p antennas of said array;

c) using said at least one p-dimensional array vectors to derive a velocity of said mobile device;

d) using said velocity to determine said customized information; and

e) using said velocity to select a means to transmit said customized information to an information user.

16. The method of claim **15** wherein said information user is said user.

17. The method of claim **15** wherein said information user is an external network.

18. The method of claim **15** wherein said mobile device is a transmitter-receiver, and wherein said customized information is transmitted exclusively to said transmitter-receiver.

19. The method of claim **15** wherein said customized information is transmitted exclusively to a remote receiver.

20. The method of claim **19** wherein said remote receiver is connected to a public display unit, such that said customized information is displayed on said public display unit accessible to said mobile user.

21. The method of claim **20** wherein said public display unit is selected from the group consisting of: an electronic billboard, a display screen at a service station, a kiosk equipped with wireless reception capability.

22. The method of claim **15** wherein said customized information is transmitted to a broadcaster selected from the group consisting of: a television broadcaster and a radio broadcaster.

23. The method of claim **15** wherein said customized information is transmitted to a data receptacle selected from the group consisting of: an internet web site, an electronic mail account, a pager, a mobile phone, a modem, and a fax machine.

24. The method of claim **15** wherein said customized information includes commercial services, advertising information, traffic conditions, public safety and emergency announcements.

25. A method of determining a traffic density using a base transceiver connected to an antenna array, said method comprising the steps of:

a) receiving at said antenna array RF signals originating from a plurality of mobile devices, wherein said RF signals comprise p-dimensional array vectors sampled from p antennas of said array; and

b) using the p-dimensional array vectors to determine locations of said mobile devices from measured subspaces to which said array vectors are approximately confined.

26. The method of claim **25** further comprising the step of comparing said locations of said mobile devices to positions of roadways, thereby determining traffic densities of a plurality of segments of said roadways.

27. The method of claim **26** further comprising the steps of:

a) determining a location of a remote transceiver;

b) selecting a local roadway segment in a vicinity of said remote transceiver; and

c) transmitting to said remote transceiver the traffic density of said local roadway segment.

28. The method of claim **26** further comprising the steps of:

a) receiving a request containing a destination location from a remote transceiver;

b) selecting a roadway segment in a vicinity of said destination location; and

c) transmitting to said remote transceiver the traffic density of said roadway segment.

29. The method of claim **28** further comprising the step of updating the traffic density and transmitting the updated traffic density to said remote transceiver.

30. The method of claim **25** wherein said locations are determined at a time t_1; and wherein said method further comprises the steps of:

a) determining later locations of said mobile devices at a later time t_2; and

b) determining velocities of said mobile devices from said locations determined at time t_1 and said later locations determined at time t_2.

31. The method of claim **30** further comprising the step of using said velocities to determine average traffic speeds on roadways.

32. The method of claim **31** further comprising the steps of:

a) determining a location of a remote transceiver;

b) selecting a local roadway segment in a vicinity of said remote transceiver; and

c) transmitting to said remote transceiver the average traffic speed on said local roadway segment.

33. The method of claim **31** further comprising the steps of:

a) receiving a request containing a destination location from a remote transceiver;

b) selecting a roadway segment in a vicinity of said destination location; and

c) transmitting to said remote transceiver the average traffic speed on said roadway segment.

34. The method of claim **33** further comprising the step of updating the average traffic speed and transmitting the updated average traffic speed to said remote transceiver.

35. In a wireless communications system comprising a plurality of RF receiving sites, a method of providing customized information related to a user of a mobile device, the method comprising:

a) receiving at a RF receiving site one or more RF signals originating from said mobile device;

b) deriving a p-dimensional array vector from the one or more RF signals;

c) using the p-dimensional array vector to derive a location of said mobile device;

d) using said location to determine said customized information; and

e) using said location to select a means to transmit said customized information to the user.

* * * * *

US006650902B1

(12) **United States Patent**
Richton

(10) **Patent No.: US 6,650,902 B1**
(45) **Date of Patent: Nov. 18, 2003**

(54) **METHOD AND APPARATUS FOR WIRELESS TELECOMMUNICATIONS SYSTEM THAT PROVIDES LOCATION-BASED INFORMATION DELIVERY TO A WIRELESS MOBILE UNIT**

(75) Inventor: **Robert Ellis Richton**, Morris, NJ (US)

(73) Assignee: **Lucent Technologies Inc.**, Murray Hill, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/440,047**

(22) Filed: **Nov. 15, 1999**

(51) **Int. Cl.**[7] **H04Q 7/20**

(52) **U.S. Cl.** **455/456.3**; 455/414.1; 455/414.3; 455/404.2

(58) **Field of Search** 455/456, 456.4, 455/456.3, 404.2, 414.1, 414.3

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,461,390	A		10/1995	Hoshen
5,502,757	A	*	3/1996	Bales et al. 379/58
5,559,520	A	*	9/1996	Barzegar et al. 342/357
5,938,721	A	*	8/1999	Dussell et al. 701/211
6,115,611	A		9/2000	Kimoto
6,122,520	A	*	9/2000	Want et al. 455/456

FOREIGN PATENT DOCUMENTS

JP	10-013961	9/2000
WO	97/41654	11/1997
WO	98/08314	2/1998
WO	98/59506	12/1998
WO	99/33293	7/1999
WO	99/45732	9/1999
WO	00/41412	7/2000

OTHER PUBLICATIONS

"Activehome" website, Oct. 1999.

* cited by examiner

Primary Examiner—William Trost
Assistant Examiner—Andrew T Harry

(57) **ABSTRACT**

A wireless telecommunications system uses location or position information of a wireless mobile unit to initiate the sending of location-specific information to travelers. As position information is received, it is compared to prestored position information of a remote location, such as an airport. As the traveler approaches the remote location, and gets within a certain distance the remote location, information such as airline arrival information is retrieved and sent to the wireless mobile unit of the traveler. Thus, useful information tied to the position of the wireless mobile unit, such as airline or traffic information for example, is obtained.

58 Claims, 7 Drawing Sheets

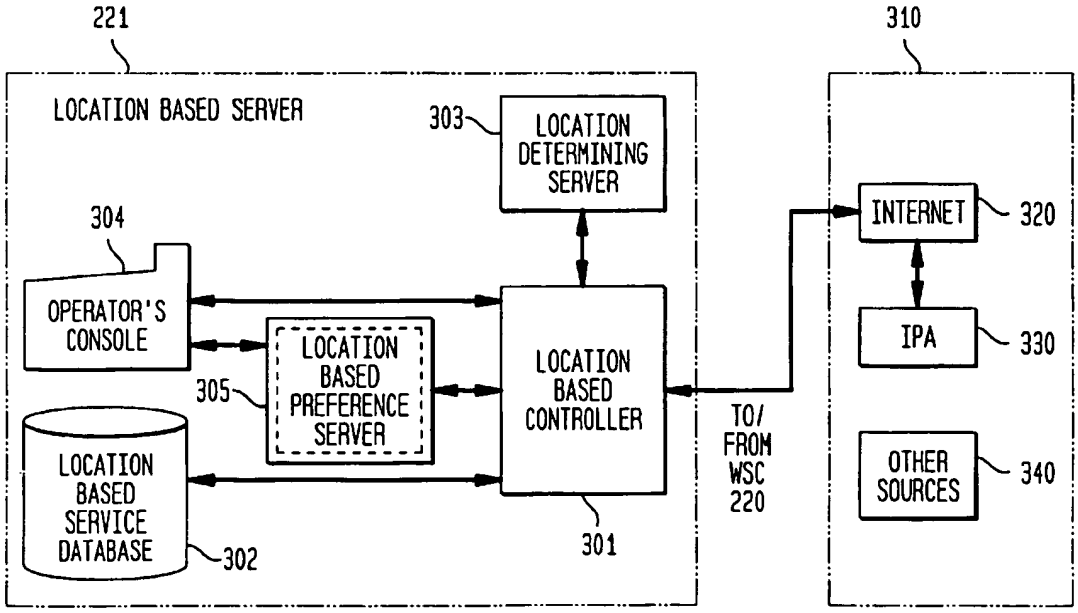


FIG. 1
(PRIOR ART)

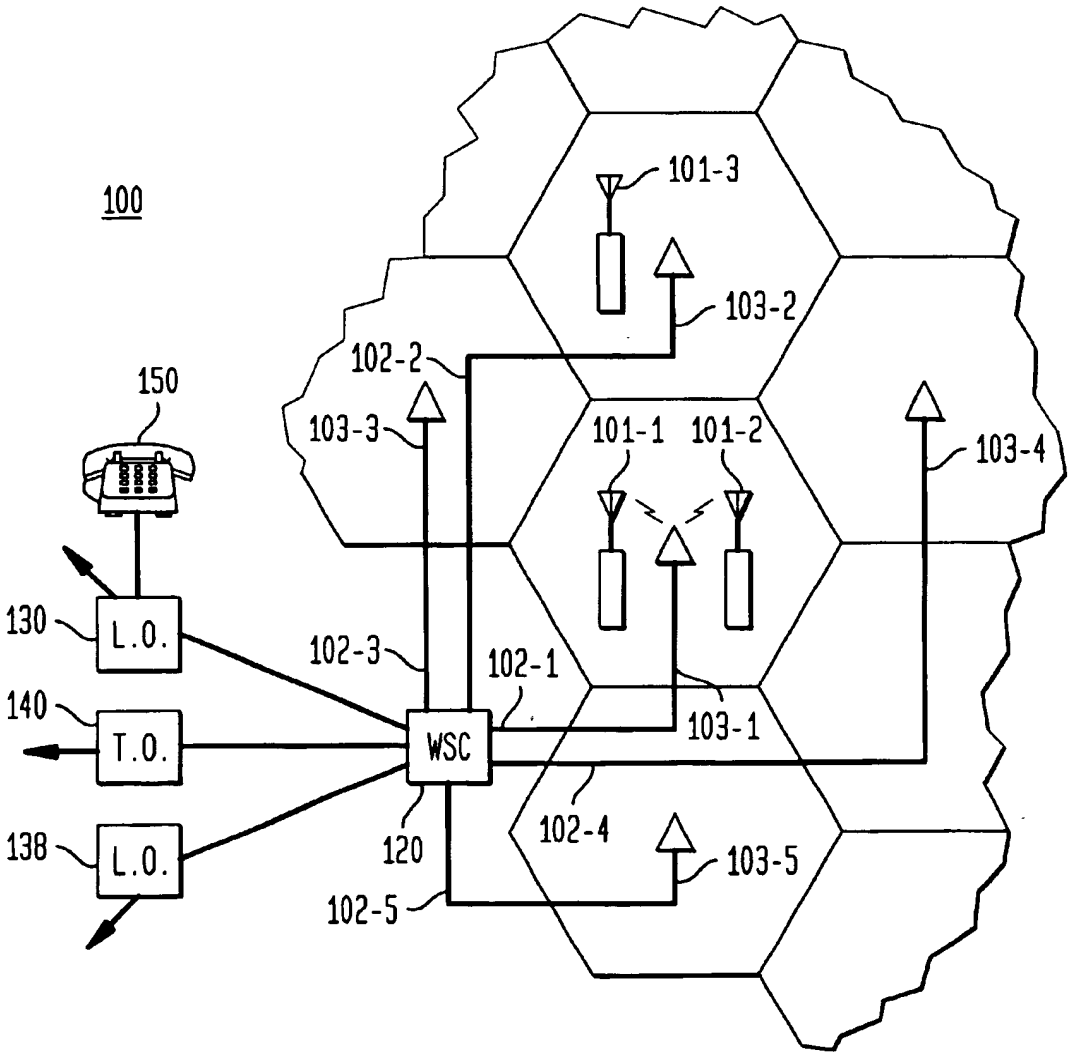


FIG. 2

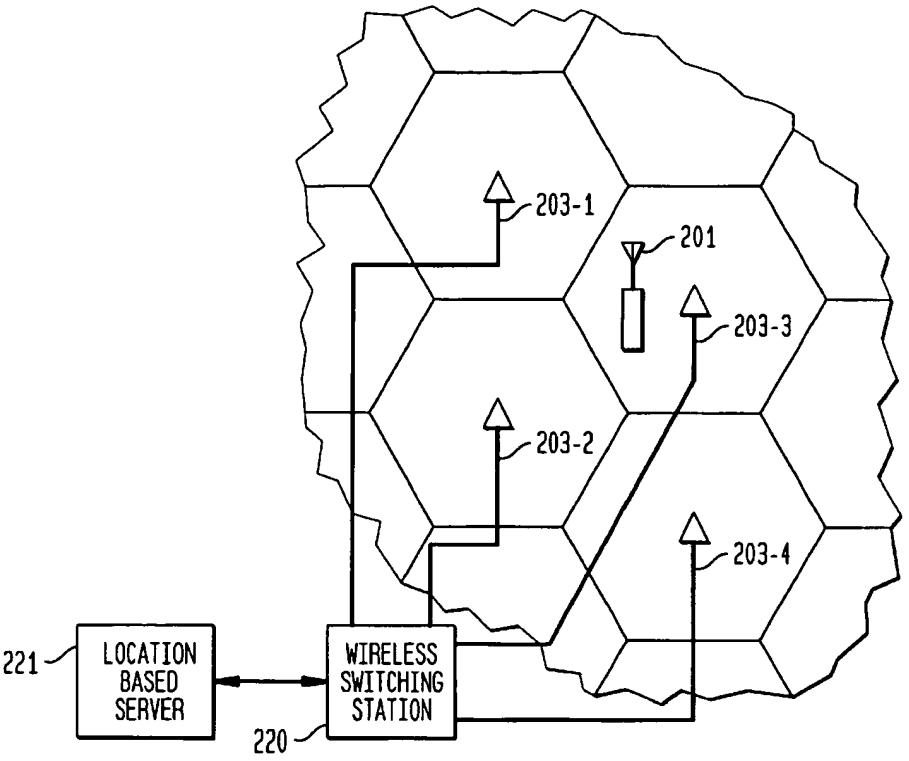

203-1
201
203-3
203-2
203-4
221
LOCATION BASED SERVER
WIRELESS SWITCHING STATION
220

FIG. 3

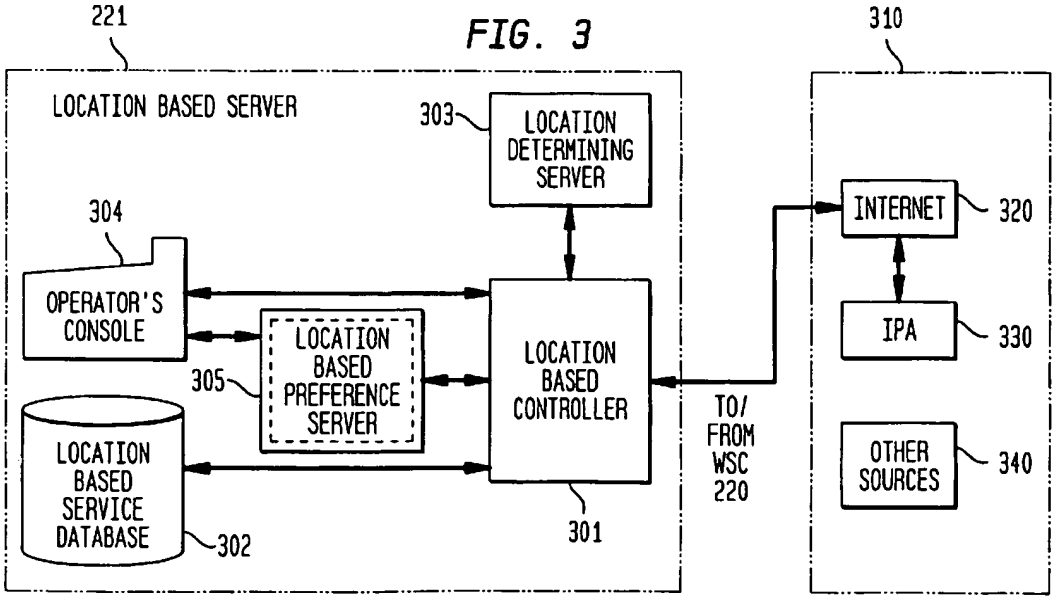

221
LOCATION BASED SERVER
303
LOCATION DETERMINING SERVER
304
OPERATOR'S CONSOLE
LOCATION BASED PREFERENCE SERVER
305
LOCATION BASED SERVICE DATABASE
302
LOCATION BASED CONTROLLER
301
TO/ FROM WSC 220
310
INTERNET
320
IPA
330
OTHER SOURCES
340

FIG. 4

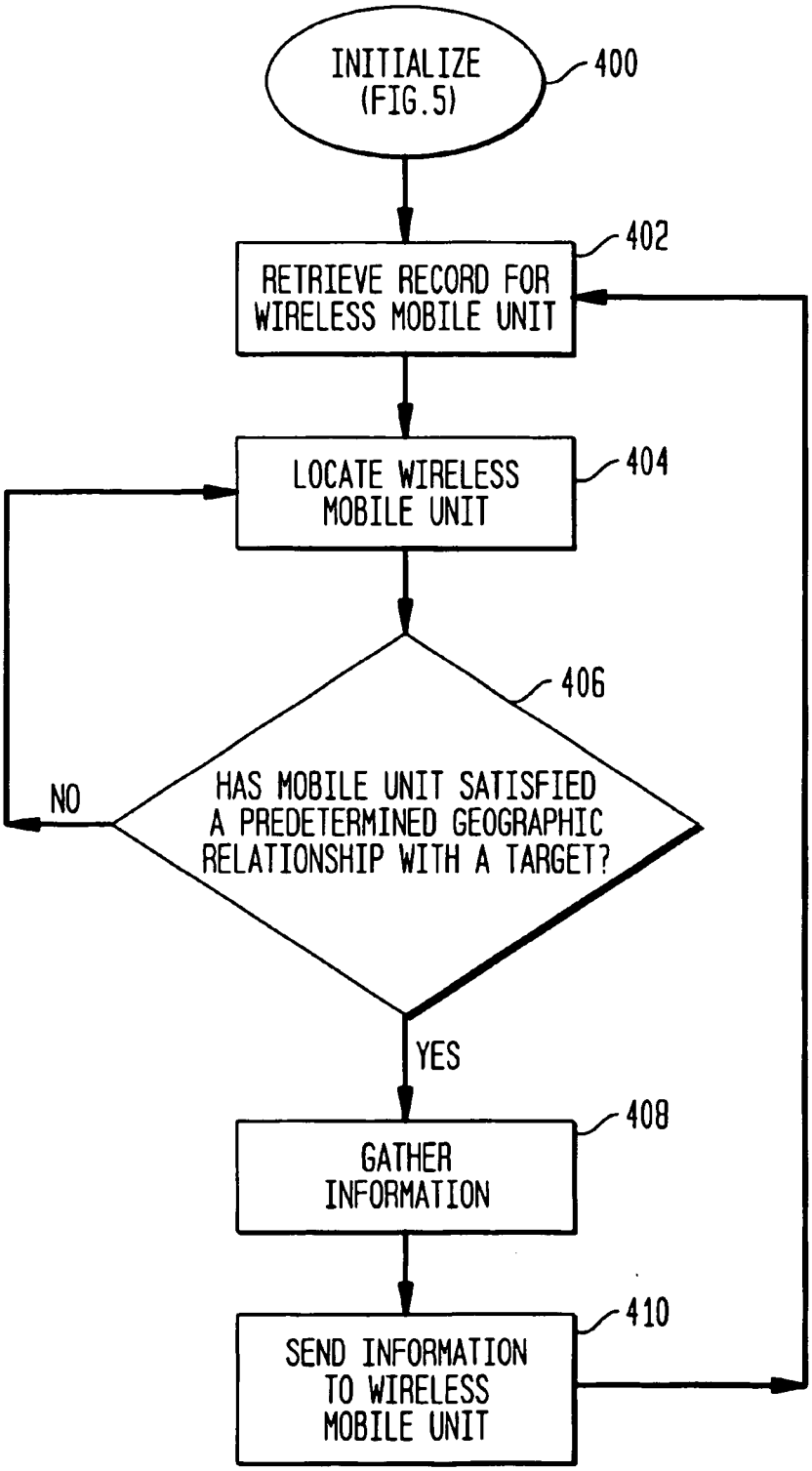

INITIALIZE (FIG.5)
400
RETRIEVE RECORD FOR WIRELESS MOBILE UNIT
402
LOCATE WIRELESS MOBILE UNIT
404
HAS MOBILE UNIT SATISFIED A PREDETERMINED GEOGRAPHIC RELATIONSHIP WITH A TARGET?
406
NO
YES
GATHER INFORMATION
408
SEND INFORMATION TO WIRELESS MOBILE UNIT
410

FIG. 5

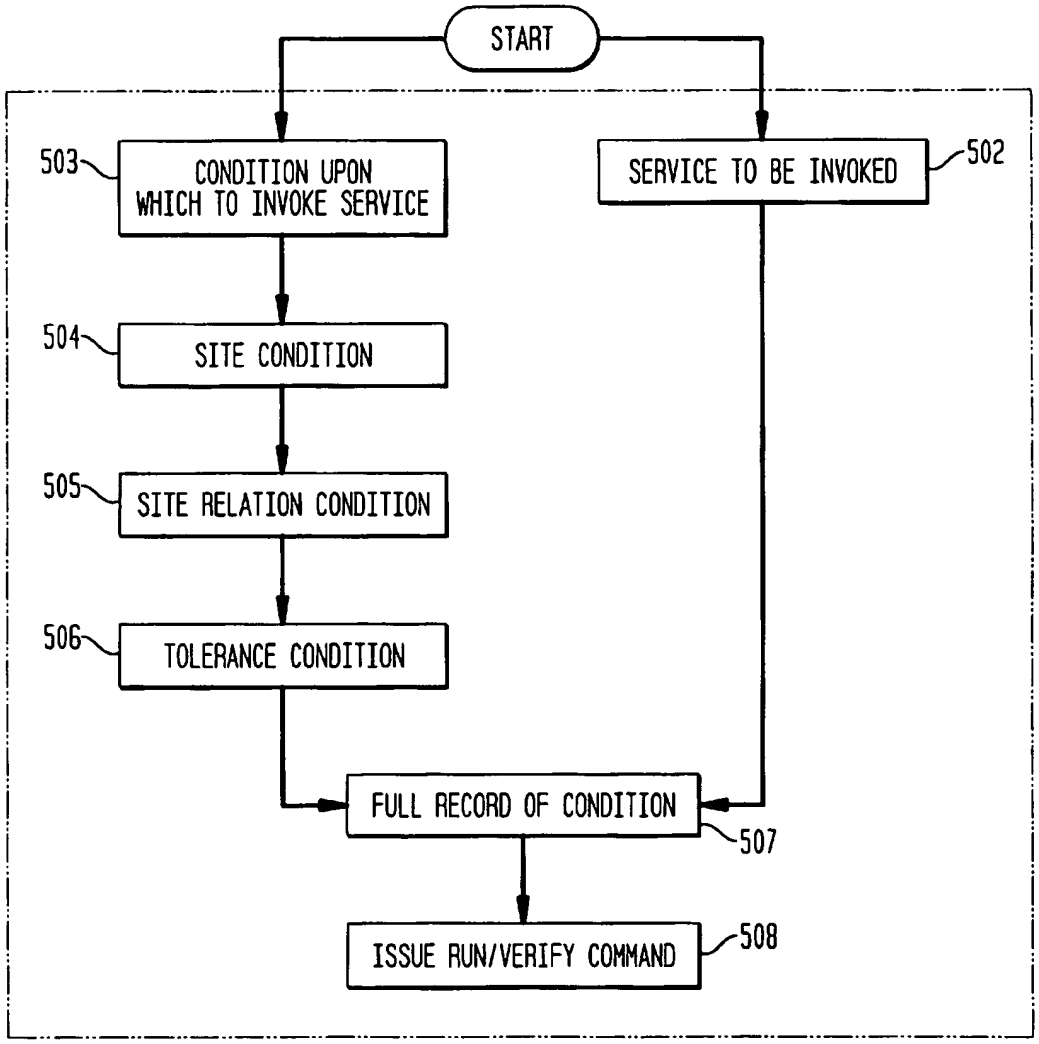

START
503
CONDITION UPON WHICH TO INVOKE SERVICE
502
SERVICE TO BE INVOKED
504
SITE CONDITION
505
SITE RELATION CONDITION
506
TOLERANCE CONDITION
FULL RECORD OF CONDITION
507
ISSUE RUN/VERIFY COMMAND
508

FIG. 6

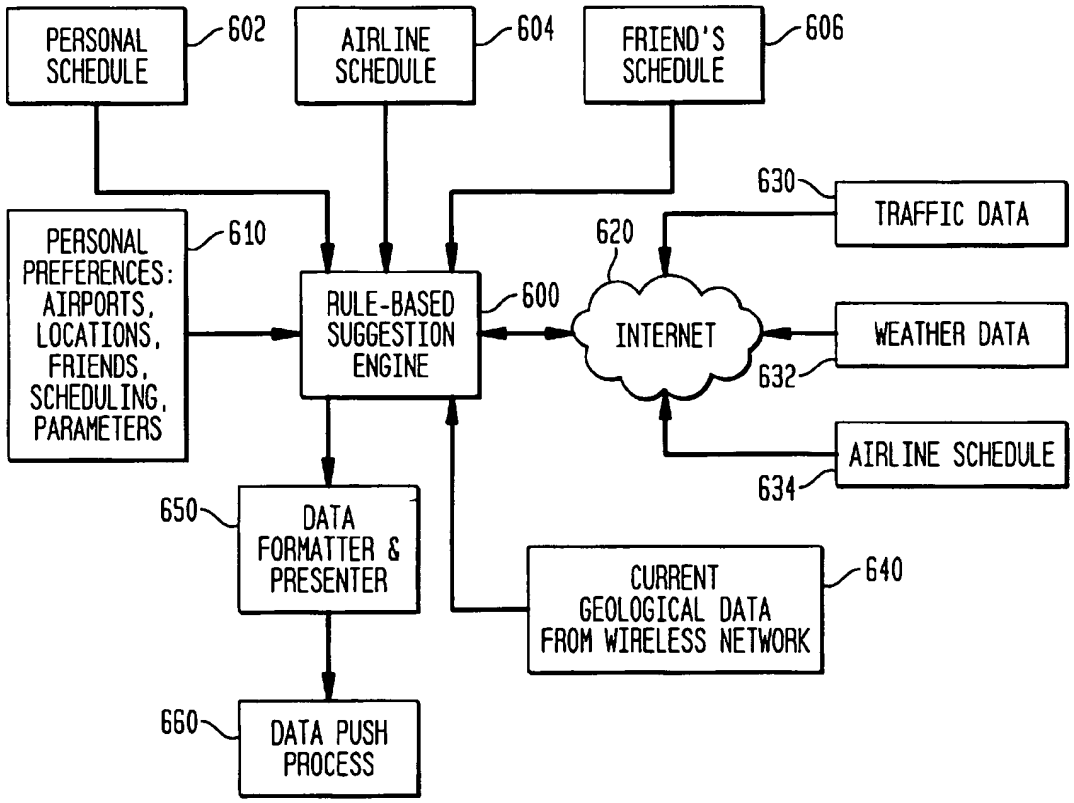

PERSONAL SCHEDULE
602
AIRLINE SCHEDULE
604
FRIEND'S SCHEDULE
606
630
TRAFFIC DATA
PERSONAL PREFERENCES: AIRPORTS, LOCATIONS, FRIENDS, SCHEDULING, PARAMETERS
610
620
RULE-BASED SUGGESTION ENGINE
600
INTERNET
WEATHER DATA
632
AIRLINE SCHEDULE
634
650
DATA FORMATTER & PRESENTER
CURRENT GEOLOGICAL DATA FROM WIRELESS NETWORK
640
660
DATA PUSH PROCESS

FIG. 7

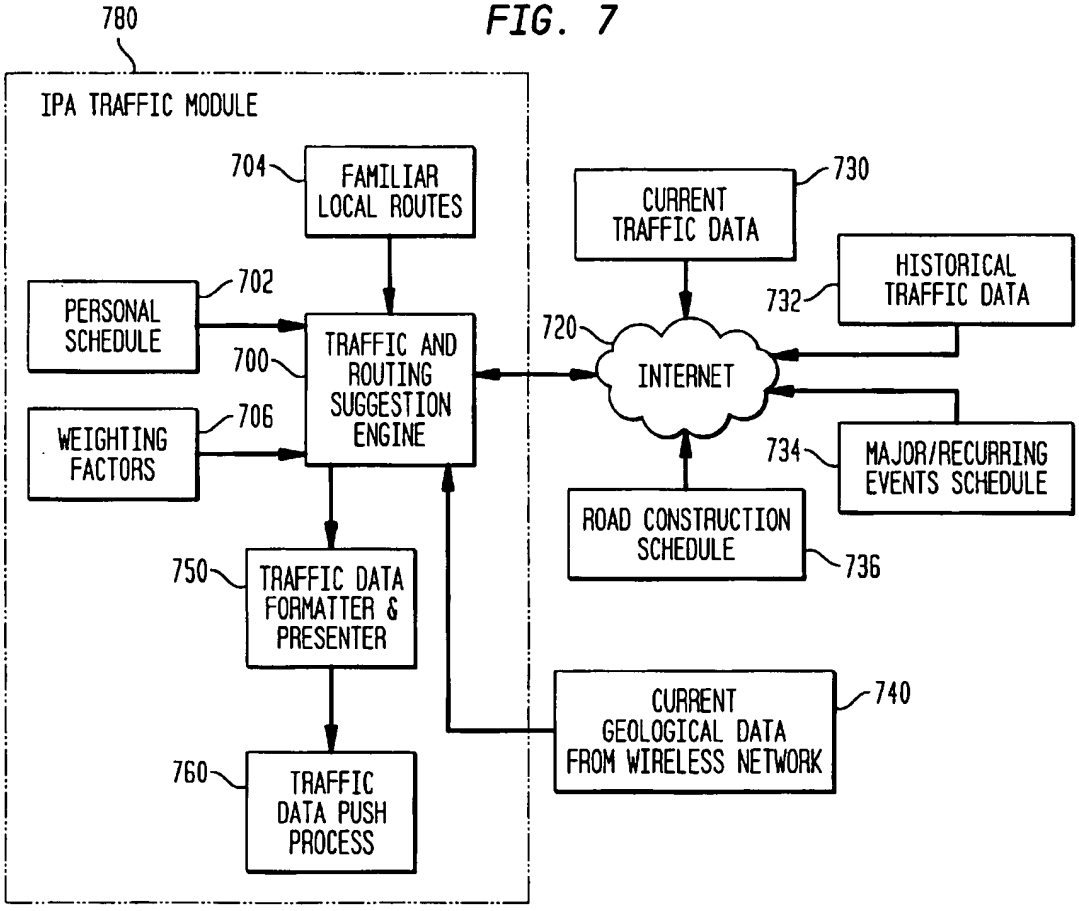
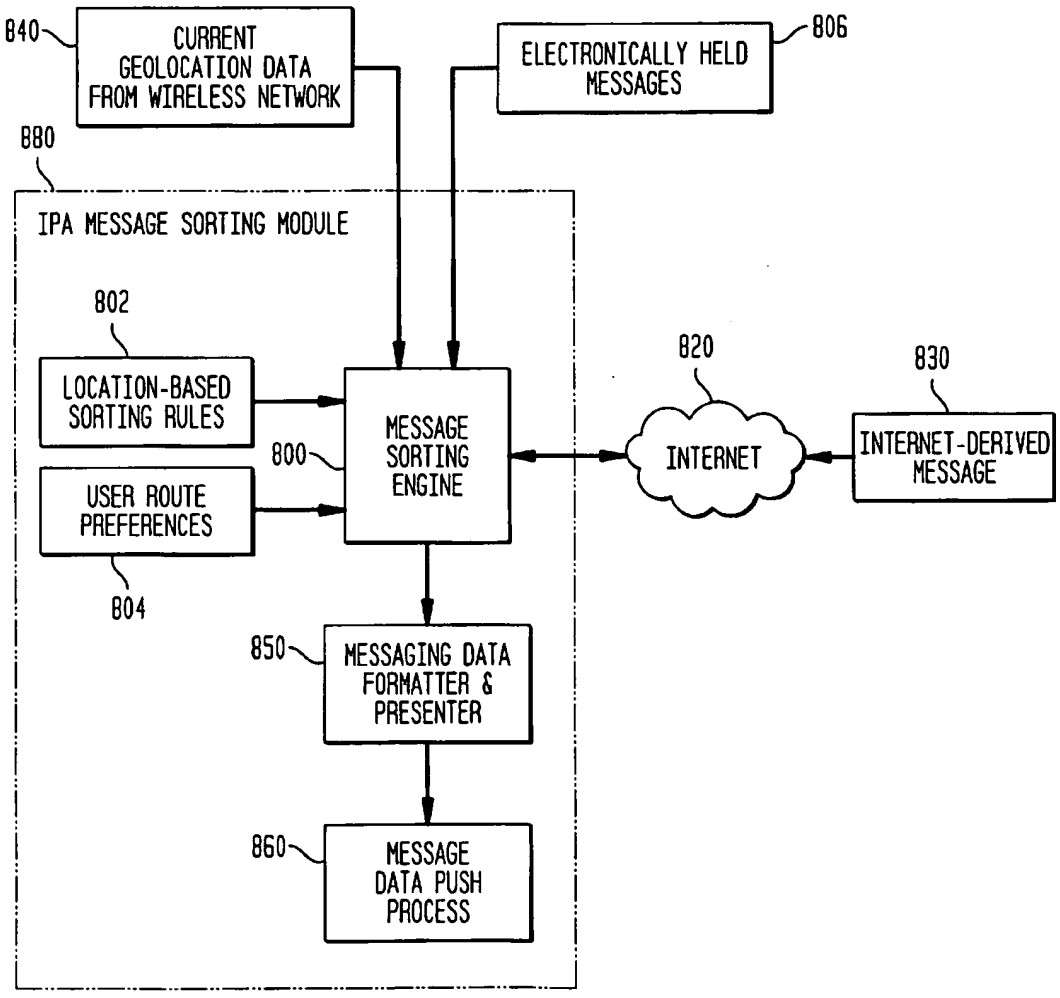

780
IPA TRAFFIC MODULE
704
FAMILIAR LOCAL ROUTES
730
CURRENT TRAFFIC DATA
HISTORICAL TRAFFIC DATA
732
PERSONAL SCHEDULE
702
TRAFFIC AND ROUTING SUGGESTION ENGINE
700
720
INTERNET
WEIGHTING FACTORS
706
734
MAJOR/RECURRING EVENTS SCHEDULE
ROAD CONSTRUCTION SCHEDULE
736
750
TRAFFIC DATA FORMATTER & PRESENTER
740
CURRENT GEOLOGICAL DATA FROM WIRELESS NETWORK
760
TRAFFIC DATA PUSH PROCESS

FIG. 8


840
CURRENT GEOLOCATION DATA FROM WIRELESS NETWORK
806
ELECTRONICALLY HELD MESSAGES
880
IPA MESSAGE SORTING MODULE
802
LOCATION-BASED SORTING RULES
800
MESSAGE SORTING ENGINE
820
INTERNET
830
INTERNET-DERIVED MESSAGE
USER ROUTE PREFERENCES
804
850
MESSAGING DATA FORMATTER & PRESENTER
860
MESSAGE DATA PUSH PROCESS

METHOD AND APPARATUS FOR WIRELESS TELECOMMUNICATIONS SYSTEM THAT PROVIDES LOCATION-BASED INFORMATION DELIVERY TO A WIRELESS MOBILE UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to telecommunications in general, and, more particularly, to a wireless telecommunications system.

2. Description of Related Art

FIG. **1** depicts a schematic diagram of a portion of a known wireless telecommunications system, providing wireless telecommunications service to a number of wireless mobile units (e.g., wireless mobile units **101-1** through **101-3**) that are situated within a geographic region. The heart of a typical wireless telecommunications system is a wireless switching center ("WSC") **120**. Typically, the WSC **120** is connected to a plurality of base stations (e.g., base stations **103-1** through **103-5**) that are dispersed throughout the geographic region serviced by the system and to the local and long-distance telephone and data networks (e.g., local-office **130**, local-office **138** and toll-office **140**). WSC **120** is responsible for, among other things, establishing and maintaining a call between a first wireless mobile unit and a second wireless mobile unit or, alternatively, between a wireless mobile unit and a wireline mobile unit (e.g., wireless mobile unit **150**), which is connected to the system via the local and/or long-distance networks.

The geographic region serviced by a wireless telecommunications system is partitioned into a number of spatially distinct areas called "cells." As depicted in FIG. **1**, each cell is schematically represented by a hexagon. In practice, however, each cell has an irregular shape that depends on the topography of the terrain surrounding the cell. Typically, each cell contains a base station, which comprises the radios and antennas that the base station uses to communicate with wireless mobile units in that cell and also comprises the transmission equipment that the base station uses to communicate with the WSC **120**. However, locating wireless mobile units within a cell was often difficult.

Recently, global positioning systems (GPS) have been developed to the point where they are very inexpensive to implement. Thus, such systems may soon be prevalent in wireless mobile units to determine precise location thereof. In addition, in the area of wireless technology, assisted GPS is being developed to improve on normal GPS for position or location detection in wireless mobile units. Further, other known systems already exists (such as known triangulation methods) for precisely locating wireless mobile units. And still others are constantly being developed. Therefore, a need exists to create other uses for the location or position information of wireless mobile units.

Increasingly complex modern life leaves many people eager for means of simplifying their busy lives. While information is readily accessible to aid in day to day situations, the information is general and not tailored to individuals. For example, radios provide information to people, but this information is for the benefit of the general public, or at best a local area. Thus, a need for developing a system which tailors beneficial information to specific individuals exists.

SUMMARY OF THE INVENTION

The present invention is directed to a wireless telecommunications system that uses location or position information to forward specific information to travelers. As position information of a wireless mobile unit of the traveler is received, it is compared to existing stored position information. Based upon the location of the traveler and instruction information stored in association with information identifying the wireless mobile unit, information particularly useful to the traveler is output to the wireless mobile unit.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereafter and the accompanying drawings which are given by way of illustration only, and thus are not limiting of the present invention, wherein like reference numerals represent like elements and wherein,

FIG. **1** is a schematic diagram of a known wireless telecommunications system;

FIG. **2** is a schematic diagram of a wireless telecommunications system including the location-based server of an embodiment of the present invention;

FIG. **3** is a block diagram of the salient components of the location based server of FIG. **2** and connections to external devices;

FIG. **4** is a flowchart illustrating operation of an embodiment of the present application;

FIG. **5** is a flowchart depicting the registration steps involved in establishing location-based information parameters;

FIG. **6** illustrates an embodiment of the present invention including use of an IPA;

FIG. **7** illustrates an embodiment of the present invention including use of an IPA in a traffic module example; and

FIG. **8** illustrates an embodiment of the present invention including use of an IPA in a message sorting module example.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The illustrative embodiment of the present invention enables the use of both the telecommunications capability and the location-finding capability of a wireless telecommunications system. These capabilities are combined to direct specific information to a user, the information having a relationship with his location. In general, the illustrative embodiment performs two fundamentally distinct steps. In accordance with the first step, the movement of a wireless mobile unit, preferably a wireless phone, is located and an incoming data stream of the user's location is maintained. In accordance with one aspect of the second step, the illustrative embodiment sets geographically based criteria, at the direction of the user, dictating when and what kind of location-based information is retrieved and sent back to the wireless mobile unit. In accordance with another aspect of the second step, information relating to location of the wireless mobile unit is periodically or continually sent to the wireless mobile unit.

FIG. **2** is a schematic diagram of a wireless telecommunication system including the location-based server **221** of a preferred embodiment of the present invention. The system includes a wireless switching center (WSC) **220** connecting the location-based server **221** with base stations **203-1** through **203-4**, wherein it is understood that the number of base stations is exemplary only. Such a system is capable of: (1) providing wireless telecommunications service to wireless mobile unit **201**, including location-based services

based on location of the wireless mobile unit **201**; (2) monitoring the movement (changing location) of wireless mobile unit **201** as it remotely travels; and (3) providing location-based information back to the wireless mobile unit **201**, based on the observed changing locations of wireless mobile unit **201**. The location-based server **221** is responsible for providing all location-based information services for wireless mobile unit **201**.

FIG. **3** is a block diagram of the salient components of location-based server **221**. The location-based server **221** includes a location-based controller **301**. The location-based controller **301** is connected to each of a location-based service database **302** (a memory, adapted to store: information identifying the wireless mobile unit **201**, such as a telephone number; instruction information in association with the telephone number indicating kinds of information to be output for and eventually to the wireless mobile unit **201**, such as email, traffic information, airline schedule information, etc.; geographic relationship information, such as position or location threshold information, etc.; as well as remote location information including an airport, an office, etc.); location determining server **303**; input device such as a console of an operator **304**; and location based preferences server **305**. Location based preferences server **305** may optionally be a part of the location-action server **221** that maintains a profile for each supported user and "understands" the preferences users, e.g., airline preference, priorities of importance to a user, etc.

In one preferred embodiment, at least some of such preference information is stored in a personal IPA (intelligent personal assistant) of a user which is linked to the other system components of the location-based server **221** so as to customize information eventually fed back to the user, so as to meet the user's specific desires and preferences. Accordingly, as would be understood by one of ordinary skill in the art, any aspects of the present invention discussed using an IPA could also be done using a centralized location based preferences server **305**, and vice-versa.

The location based preferences server **305** translates and cooperates with the location-based service database **302** so as to permit simple commands to be transmitted to the wireless mobile unit **201**. Further, the location based preferences server **305** "understands" the user's preferences (e.g., preference for particular airline schedule when the user has approached a threshold, such as within 2 miles of the airport, for example). The location based preferences server **305** matches a user's stored preferences of airlines, for example, to stored location based preferences, such as receiving airline info when within 2miles of the airport, and maintains the user's specified actions and preferences as a user profile, to be invoked whenever the user calls for location-based services. It should be understood that the location based preference server **305** can associate either or both of the aforementioned information or rule based preference information, such as a particular desired airline (although these may be more desirably stored in an IPA due to their changeability), as well as location based geographic relationship triggering preferences (such as when airline scheduling info should be sent, i.e. within 2miles of the airport). Of course, much if not all of this information is stored in the memory of location-based service database **302**.

Location-based controller **301** is, for example, a computer programmed to orchestrate location-based services, such as those involving sending data back to the wireless mobile unit **201** (examples of data sent including traffic alerting and location-based advertising). Location-based controller **301** controls the operation of the other elements in location-based server **221**.

Location-based service database **302** is a database or memory that additionally preferably contains, among other things, digitized maps of geographic areas serviced by the location-based server **221** and WSC **220**. These are used for comparison with a current location of a wireless terminal **201** to determine whether to obtain and send certain information back to the wireless mobile unit **201**, through WSC **220** and a controlling base station; and/or to determine what type of information to retrieve and send to the wireless mobile unit **201**. The geographic data and related data may be embodied in a Geographic Information System (GIS), for example.

Location-based service database **302** further preferably contains not only the GIS database, but also GIS processing software that enables geographic functions, chiefly determining proximity relationships sometimes enabling the functionality described herein as will be explained in more detail hereafter. Some personal preferences may also be established in location-based service database **302** and/or as part of a location based preferences server **305** and/or as part of an Intelligent Personal Agent (IPA) of a user. These preferences may create an understanding for the processing of information such as particular roads frequently used by the user of a wireless mobile unit **201**; airports, offices, or other places that correspond to a set geographic area.

Location-based service database **302** further preferably stores a list of things to be done or information to be gathered in association with a designated wireless mobile unit **201** and the geographic area (distance/proximity thresholds) that will be considered to meet a criteria for initiating information gathering to be performed, eventually leading to some type of information being sent back to the wireless mobile unit **201**. These can be customized by the user. For example, information to be gathered when a user approaches the airport can include airline information such as airline flight or flight schedule information, delayed flights, information on connections, information on specific airlines, etc.; and such information can be obtained when a user of a wireless mobile unit **201** has satisfied a geographic relationship with a remote location, such as when the wireless mobile unit **201** is within 10, 15, or 2miles of an airport. Since the type of information desired is most likely variable, this type of information may be stored in an IPA of the user, which is easily linked to a telephone of a user as is known to those of ordinary skill in the art. Such information can also be stored in an optional separate location based preferences server **305**; however the need for such a separate server is unlikely as all necessary information can likely be stored in the location based service database **302**, with the possible addition of an IPA.

The external information sources **310**, including an IPA **330** of a user, the internet **320** and other information sources **340**, are preferably established separately from location-based server **221**, but in a manner consistent and in communication therewith through location-based controller **301**. Any of the internet **320**, IPA **330** and other sources **340** can communicate directly with one another and directly with the location-based server **221** through the WSC **220**. Information can be requested and received by location-based controller **301** accessing any of the external information sources **310** through WSC **220**. Instantiations employing GIS and IPA technologies, while helpful, are not essential to the functionality disclosed herein.

Location-based service database **302** further preferably contains a list of services (or instruction information) to be

performed in association with a designated wireless mobile unit **201** and the geographic area (places or remote locations/roads/distance/proximity thresholds) that will be considered to meet a criteria for initiating control of services to be performed (i.e., indicating when a geographic relationship has been satisfied). These can be customized by the user. For example, services performed when a user approaches/leaves his/her home/office (remote location) can include retrieving and forwarding to the wireless mobile unit **201**, traffic information specific to the roads on which the user is traveling or will be traveling in the near future. Further, unique remote locations such as airports, for example, can be designated such that when the wireless mobile unit **201** is within a certain distance of an airport and has therefore satisfied a designated geographic relationship with a remote location, airline schedule information is received. Based on stored information, alternate routes of travel can also be provided directly to the wireless mobile unit **201** (when the wireless mobile unit **201** has satisfied a geographic relationship with the remote location or target, such as coming within a predetermined distance thereof, for example). Other types of information forwarded to the wireless mobile unit include, but are not limited to weather information and personal information (such as email, facsimile, voicemail, etc.).

Such services may be performed in conjunction with a home-based IPA **330**. This IPA **330** stores specific information such as a user's preferred airlines for example, and is then used to further tailor the information retrieved from an external source based upon stored rules or parameters, so that specific or modified information is sent to the wireless mobile unit **201** to meet a user's needs. The IPA **330** is programmable to tailor information sent to a user, based upon a user's semi-permanent preferences and information specific to circumstances of place and time. For example, the IPA **330** may be programmed to know how to best deliver information because of its programmed knowledge of the user and the prevailing data rates associated with the wireless network and the parts of that network currently serving the user. Furthermore, the IPA **330** is programmable in a known manner to link a user's schedule to other schedules, such as to the schedule of the airlines or other individuals, for example.

The IPA **330** is further programmable in a known manner, with rules that enable it to suggest schedule changes or modifications. These may involve interactions with data that are routinely linked for such circumstances (such as weather data or with the schedules of other people that have extensive interactions with the user). The addition of location dependent data in connection with the present invention, which is then used by such a sophisticated programmable IPA **330** to draw conclusions about scheduling based on its preprogrammed information and based on the user's location, are all factorable into the information transmitted back to the wireless mobile unit **201** of the user. The user can therefore be informed of not only normal flight schedule information, for example, but of suggested changes and reasons for such changes. These may involve application of a simple rule in the IPA **330**, such as a desire of the user to wait a short time should that allow the user to be comfortably put on a preferred airline, or very complex rules, such as diverting a user to another airport in a large metropolitan area such as N.Y. city, to provide a user with a desired opportunity to meet new associates.

Similarly, depending on desired services stored in location-based service database **302**, various aspects of the internet **320** or other sources **340** (such as traffic information sources) can be tailored or modified by IPA **330** to meet a user's needs. Because so much information has been, and will continue to be, made available over sources like the internet in common, standardized and well known ways, a computer-based application can be written to access many databases including, for example, but not limited to airline flight schedules, schedules of individuals who have granted access to their daily/hourly schedules, road and traffic information, weather, etc. It will be familiar to those of ordinary skill in the art how somewhat diverse information sources can be integrated into a rule-based decision making capability of an IPA **330** or a general purpose computer, in a manner similar to the airline schedule example given above and that all such various uses of diverse information, in combination with location-based information, are encompassed within the scope of the present invention.

It should be noted that rules or specific information can, but need not, be programmed in a remote IPA **330**. Any type of information, such as personal information (email, voicemail, facsimile, etc.), airline flight information, traffic information, etc., can be sent directly from a source when a geographic relationship with a remote location is satisfied, and need not involve an IPA **330**.

The external information sources **310** receive signals requesting information from location-based controller **301** through the WSC **220** and phone lines; either wireless or land-lines, connected to external information sources **310** in a known manner; and send the requested information back to the location-based controller **301** through the WSC **220** and phone lines, to enable specific information to be sent back to wireless mobile unit **201**.

Location determining server **303** determines the location of a wireless mobile unit **201** when requested to do so by location-based controller **301** and provides location-based controller **301** with that information when it is obtained. The location of wireless mobile unit **201** can be determined in a number of known ways including global positioning systems (GPS) and assisted GPS used in conjunction with wireless mobile units and signals **210** sent therefrom, and other known techniques such as triangulation, for example. How the location information is obtained is riot limiting of the present invention. Location-based controller **301**, in conjunction with location-based preference server **305**, determines the identification of wireless mobile units for which location determining server **303** monitors and identifies position/location information.

Location-based preferences server **305** works in conjunction with location-based controller **301** to determine which wireless mobile units are to be monitored; what are location/geographic relationship thresholds at which information is to be obtained; what information is to be obtained when geographic relationships are satisfied and from where is the information to be obtained; etc. The functioning of location-action and preference server **305** includes the set-up and authorization of users and may use Wireless Intelligent network authorization procedures such as those used for set-up of other wireless services such as call-waiting, voice-activated dialing, etc. Details of the functioning of such service profiles will be familiar to those of ordinary skill in the art, as will there set-up, maintenance and termination. This can be a service that a wireless mobile unit user signs up for, for example. The functioning of the location based preferences server **305** further includes performing of threshold tests and invoking services, when appropriate, as will be described further hereafter. This can be a service that a wireless mobile unit user signs up for, for example.

Operator's console **304** enables travelers (users) to call the location-based server **221** to request a service or change

of wireless mobile unit **201** in preference in a user's wireless service file, for example. Thus, stored remote locations/geographic relationships/thresholds/information types, etc. can be modified. Alternatively, the operator's console **304** could be replaced by automated processes, linked to menus in the wireless mobile unit **201** of the user, for example. Some of the functionality described above can be automated by using an understanding of related user preferences, such as the options for different output devices that the user may tie to his/her wireless service file, which may be located elsewhere in the wireless network.

FIG. **4** is a flowchart of the operation of an illustrative embodiment of the present invention, wherein position/location movement of a wireless mobile unit **201** is preferably tracked as it travels during a trip and wherein that information is then preferably used in near real-time to initiate location-based information retrieval. In doing so, the illustrative embodiment performs two fundamentally distinct, major steps: (1) specifying the desired services by the recording information to be obtained on behalf of the user and the geographic conditions (remote location thresholds, etc.) under which that information will be obtained, and (2) the monitoring of the user's location against the geographic criteria (threshold position for comparison): if the conditions are met, the information will be obtained and some information output for the wireless mobile unit **201**; if conditions are not met, position/location monitoring will continue as long as the basis for the service remains.

Prior to step **400** in FIG. **4**, a user of a wireless mobile unit **201** initially decides to subscribe to a location-based service. The user may have specific designatable remote locations in mind (which will generally be a familiar location such as road leading from home to office or to a friend's home, for example, or another area for which specific information is requested, such as an airport, for example), and specific information to be collected when a geographic relationship with the designated location is satisfied. It should be noted that the specific type of information, such as a specific airline for which flight information is requested could be programmed in a remote IPA **330** of a user. This can be done in combination with rules including simple rules involving weather data, for example, and complex rules involving arranging connections and flights through a specific city to enable meetings with associates, for example. This information may be associated with routine events, such as the reporting of traffic conditions for the roads leading to the office or coming home from the office; or may include more complex information including alternate route suggestion. The information is retrieved and information is sent to the wireless mobile unit **201** via WSC **220** and a controlling base station, based on the fact that the user has satisfied a set geographic relationship with a designated location, e.g., the information is retrieved and information is sent to the wireless mobile unit **201** when a user is within a certain distance of the designated location (such as the airport, for example) based upon a location of the wireless mobile unit **201** which is with the user. Additionally, prior to step **400** of FIG. **4**, the wireless network ascertains that the user is authorized for location-based services—a step which implies the user has a wireless mobile unit **201** that can be located routinely with little impact on the network. This will often be the case.

Initially, the process begins with step **400** of FIG. **4** wherein the process is initialized at the location-based server **221**. Information to be obtained, sources from which the information is to be obtained, locations at which services are to be performed, threshold positions/geographic relationships dictating when information is to be obtained, etc., are stored at location-based server **221**. Thus, the user essentially subscribes for the service and defines the parameters. This process will be described in more detail with regard to FIG. **5**.

As previously stated, the steps involved in establishing parameters defining where, when, to whom, and what information is to be obtained and sent are described in FIG. **5**, further defining step **400** of FIG. **4**. Initially, in step **502**, the service to be involved is established. A user interface at the wireless mobile unit **201** might include location-based services, such as navigation assistance or location-based traffic reports. The user invokes (subscribes and dictates the parameters desired) the location-based service by initializing, either through a menu on his/her wireless mobile phone **201** or through a similar mechanism such as that which could be provided over the Internet. Alternatives to invoking over the Internet include speaking to an operator or using an IPA (Intelligent Personal Agent). Those skilled in the art will recognize how to construct these various alternative devices for invoking/starting the service, but the menu interface is described further here.

Once in the menu for location-based services, the user interface presents a list of information/service types, and a list of triggering remote locations(home, office, airport, etc.), for example. In more advanced versions, nearly free-form inputs could exist, such that any type of information that could be understood by an intelligent module (IPA) could be included. The list of information can include traffic information or reports, alternate route selection, airline information, personal information such as voice or email, etc.

Besides specifying the information to be obtained in Step **502**, the user must specify the geographic conditions under which the service will be invoked in step **503**. These are further defined in steps **504** and **506**. This establishes the location dictating when information is retrieved; the "location-basis" under which information is obtained; external sources from which information is to be retrieved; how retrieved information is used in determining information ultimately sent to the wireless mobile unit **201** through WSC **220** and a controlling base station; and when information is to be retrieved.

First the user specifies the designated site (remote target location) that is to be the basis of the information retrieval in step **504**. The site may be chosen from a pre-programmed list, including such items as "home," "office," "airport," "mother's house," etc. These sites, while using familiar names, will be translated by the location based controller **301** into street addresses, latitude/longitude, UTM (Universal Transverse Mercator), or a similar location designation scheme that can be dealt with by a Geographic Information System (GIS). This, and all other selected information is stored at location-based server **221**, preferably in a location-based service database **302**.

The geographic criteria or relationship (threshold position/location at which information retrieval is triggered) is set in Step **505** as the Site Relation Condition. The most common criteria will be proximity. For example, as a proximity threshold, the user sets 5 miles such that when the wireless mobile unit **201** is within 5 miles of the designated target location (e.g., the airport), then the determined geographic relationship with the designated target will be satisfied and information retrieval will be triggered (e.g., contact IPA **330**, determine commonly selected airline, and

contact airport information center through internet to obtain flight information for commonly selected airlines and send to wireless mobile unit **201**). It should be noted that geographic relationships triggering information retrieval could also include entry onto a particular road, municipality, or any geographic area. Conversely, it can include leaving any geographic area or reaching a certain distance away from an area or a specific location. Thus, when a user is leaving and is one mile from home, information retrieval of traffic information for nearby or frequently traveled roads can be obtained. Many possible variations can be invoked, particularly if provisioned via a graphical interface such as that included in common GIS or Desktop Mapping schemes (see for examples, the ARC/Info products from ESRI of Redlands, Calif., or MapInfo from MapInfo, Inc, Troy, N.Y.).

Once the user has specified (1) the information to be obtained (e.g. airline flight arrivals), (2) optional modifications of the retrieved information (e.g. include only arrival information for "Delta" and "United"), and (3) the criteria or geographic relationship (typically distance within which to invoke the information retrieval, such as "5 miles" from the airport, for example), the initialization is nearly complete. However, the system may require other internal settings. The most obvious of these is the tolerance, which can be set in step **506**. By tolerance, for example, this refers to the fact that when specifying "perform information retrieval when I am within 1 mile ±100 meters", the ± part is yet to be specified. Because of its subtlety, this part may be specified by the system rather than by the user, for example. The initialization Step **400** is completed by writing the Full Record of Condition in Step **507**, which writes the information in location-based service database **302**. In step **508**, it then indicates that the location-based controller **301** may begin its process of verification/authentication, and proceed to begin controlling the service.

Once the process has been initialized, the wireless network then monitors the location of the wireless mobile unit **201** of the user at regular intervals. Note the wireless mobile unit **201** may contain the functionality needed to locate itself, and may send results to the location service controller **301** (through a controlling base station and WSC **220**); such as through GPS or modified GPS circuitry within the wireless mobile unit **201** itself. Alternatively, the location can be determined in a known manner through triangulation, etc., at the location action server **221** or WSC **220**. Those familiar with wireless location technology/functioning will recognize that for the services disclosed herein, it does not matter whether location results are calculated in the network or in the wireless mobile unit **201** itself.

For example, and as is clear to those skilled in the art, there are various ways in which the illustrative embodiment can ascertain the location of wireless mobile unit **201**. For example, wireless mobile unit **201** can include a satellite position system receiver (e.g., a Global Positioning System (GPS) receiver, etc.) so that wireless mobile unit **201** can determine its own latitude and longitude. In such a case, wireless mobile unit **201** provides its location to a controlling base station, to WSC **220** and eventually to location-based server **221** when requested. An example of such an arrangement is taught in U.S. Pat. No. 5,479,482, entitled "Cellular Terminal For Providing Public Emergency Call Location Information," issued Dec. 26, 1995.

In accordance with another technique, wireless mobile unit **201** and location determining server **303** may share the task of computing the latitude and longitude of wireless mobile unit **201**. In such a case, wireless mobile unit **201** provides an indicium of its location through a controlling base station and WSC **220**, to location determining server **303** of location-based server **221** when requested. An example of such an arrangement is described by G. Vannucci and R. E. Richton in pending U.S. patent applications Ser. No. 08/927,432, and 08/927,434.

In accordance with other techniques, either wireless mobile unit **201** or base stations **203-1** through **203-4** use of terrestrial triangulation techniques, in a well-known fashion, to determine the location of wireless mobile unit **201** based on the time-of-arrival or direction-of-arrival of signals transmitted from each other. It will be clear to those skilled in the art how to determine the location of wireless mobile unit **201** for the purposes of the present invention, and that the reporting of location to location determining server **303** (through a controlling base station and WSC **220**) at regular intervals requires merely adding a timer, for example. It will similarly be clear to those skilled in the art that wireless location determination systems will have a certain inherent accuracy, and that they generally report a confidence or uncertainty level and that that level might need to be considered when invoking any location-based service. Factoring in consideration of the areas of uncertainty will be part of any location-based service but will not be described at length here, as the considerations should be evident. For example, when criteria for invoking services are examined, the uncertainty/confidence must be considered. Depending on the nature of the action/service, different confidence levels might appropriately be invoked. However, because this is a secondary factor in invoking location-based services, its use would probably be better left to the administrative parts of location-based services rather than set by users in most cases.

Following initialization of the service (Step **400**) as explained in FIG. **5**, the process may proceed to Step **402** within the location-based server **221**. In step **402**, a record of the wireless mobile unit **201**, the location criteria or geographic relationship (designated target remote location, threshold, etc.) and the information to be obtained is established. This information is preferably stored in a record in a location based service database **302**, in association with information identifying the wireless mobile unit **201** (such as it's phone number, for example) and in association with information identifying the external information sources **310** from which information is to be obtained or gathered (such as the phone number for the Internet or a user's IPA access, etc.). It should be noted that the record stored in the location-based service database **302** may include all necessary information to carry out the retrieval of information, or may be linked to existing information, such as a known telephone number of the wireless mobile unit **201** and/or known external information source **310** numbers. The aforementioned record and other stored information may be stored in a geographically oriented database, such as are associated with GISs. Location based controller **301** records that such a record exists. At this point in the location-based controller **301** initiates the criteria checking shown in steps **404** and **406**.

The criteria checking steps **404** and **406** are the heart of the system. In step **404**, the location of wireless mobile unit **201** is preferably periodically determined/received. This is preferably done at periodic intervals, e.g., once per second. Next, in step **406**, the retrieved criteria are checked at regular intervals, typically timed to mesh with the timing of step **404**. For example, in step **406** it is determined whether or not the location information received in step **404** indicates that the wireless mobile unit **201** has satisfied the preset geo-

graphic relationship with the target location, e.g. is it within a threshold distance (e.g., 5 miles) of the target location (e.g., "airport"). These two timed processes are "merged" in a manner to check whether the location of the wireless mobile unit **201** of the user meets the criteria or geographic relationship with the target that has been set.

It should be noted that the record storage and criteria checking of steps **402–406** need not be limited to a single wireless mobile unit **201** or to a single target location. For example, if a family of users has two or more wireless mobile phones, for example, then they may designate that information be retrieved when either of the two wireless mobile phones meets the set geographic relationship. This can be set and stored in location-based service database **302**. Further, retrieval of one set of information can be triggered by either wireless mobile phone meeting a first geographic relationship with a home of the users, for example, and retrieval of a second set of information can be stored in association with only one of the wireless mobile phones, for airport related information, for example. Any combination of the above is possible and is within the scope of the present invention.

In addition, for a single wireless mobile unit **201**, multiple geographic relationships can be stored in association therewith to trigger similar or different information to be retrieved. For example, when a wireless mobile unit **201** of a user satisfies a first set geographic relationship with a first target location (e.g. home), retrieval of a first set of information can be triggered (e.g. traffic information). When the same wireless mobile unit **201** satisfies a second set geographic relationship with a second target location (e.g. airport), retrieval of a second different set of information can be triggered (e.g. airline flight information). Accordingly, upon the wireless mobile unit **201** satisfying either of the set geographic relationships with either of the respective target locations, information will be retrieved based on the respective target. Therefore, information identifying one or more various wireless mobile units can be stored in association with information of various target remote locations and in association with various set geographic relationships thereof and information to be retrieved.

Further, step **404** can be performed using criteria established outside of step **400**. Also note that there will be service provisioning steps that the providers of services described here will undertake before users can employ any steps in FIG. **4**. These provisioning steps would include, for example, initiate billing and check that the end-to-end communications protocols required for subsequent steps of the service disclosed are ready. Authentication/security functions may also be established to further protect users against unauthorized disclosures of data regarding their whereabouts (position/location), which many would want to keep private. Methods to perform such provisioning steps are well-known to those skilled in the art, as these are normal functions of public telephone networks for well-known services such as call waiting, caller-ID, etc.

If the criteria are met in step **406**, information is retrieved in step **408**. This is easily accomplished since the location-based server **221** knows the phone number of the remote external information source to be contacted to retrieve the desired information. If not, location of the wireless mobile unit **201** is monitored in step **404**. As noted previously, the information is retrieved by the location-based server **221** contacting an external information source **310** (the source to be called and phone number are stored in location-based service database **302** in association with the geographic relationship trigger). If the criteria are not met, the condition is checked again (periodically).

Thereafter, the information is sent to the wireless mobile unit **201** in step **410**. It should be noted that if the IPA is to be contacted prior to gathering information from another external source, this is stored in the location-based service database **302** and is performed when the geographic relationship is satisfied. Thereafter, specific information, as dictated by the IPA **330** is retrieved, modified, and sent to the wireless mobile unit **201** through WSC **220** and a controlling base station. Alternatively, depending on how the retrieval is programmed, information could be retrieved and modified after retrieval, and then sent to the wireless mobile unit **201** (such as a situation where traffic information for a specific region is retrieved, and then an alternate route is selected and sent to the wireless mobile unit **201**, for example).

In the case where the criteria is met in step **406**, the location-based controller **301**, having "deduced" that the criteria has been met by comparing the criteria stored in location-based database **302** with the most recent location determination result from the location determining server **303**, sends a signal to retrieve the information. This may include calling a specific telephone number (e.g., the airport or traffic hotline) or searching a specific area on the internet **320**. One of ordinary skill in the art familiar with this type of pre-programmed controller will recognize that a variety of signals may be used from this point to establish, validate, and invoke the computer-to-computer communications that enables this step (from location-based server **221** to the remote external information source **310**). The communications may take place via the Public Switched Telephone Network (PSTN) or any ordinary or extraordinary means.

FIG. **6** provides an illustration of how the IPA **330** can be used in connection with the present invention to coordinate rule-based information with location-based information. Specifically, one preferred embodiment of the present application utilizes located-based information to triggered the obtaining or gathering of information from an external source such as the Internet, and the eventual transmitting of this information from an external source to a user. However, as shown in FIG. **6**, another preferred embodiment utilizes IPA **330** to access different types of data and to apply preprogrammed rules so that more specific or modified information can eventually be output to a user of a wireless mobile unit **201**.

As shown in FIG. **6**, the IPA **330** includes a rule-based suggestion engine **600**. This rule-based suggestion engine **600** can be preprogrammed as shown by box **610**, with personal preferences of the user such as airports, locations, friends, scheduling parameters. The rule-based suggestion engine **600** of IPA **330** is analogous to an expert system that follows rules such as "if a user can reach a next destination within 2hours of his existing schedule, and still have time to meet a designated friend based on a friend's schedule, then transmit to the wireless mobile unit of a user, a revised flight schedule when the user is more than 5 miles from the airport". The rule-based suggestion engine **600** is preferably not only preprogrammed with personal preferences **610** of the user to establish particular rules, but can further pull or receive information from other external sources such as a personal schedule **602**, and airline schedule **604**, and a friend's schedule **606**. Such information can be preprogrammed or accessed by IPA **330** in a known manner.

In addition, the IPA **330** is also connectable to the Internet **620**. Via the Internet **620**, the IPA **330** can receive external information such as traffic data **630**, weather data **632**, airline schedules **634**, etc. It should be noted that the examples of information that can be received from the Internet are programmed or otherwise accessed by an IPA

330 are merely that, examples, and should not be considered limiting in any manner.

Once the rule-based suggestion engine 600 of IPA 330 is programmed with the particular desired rules so that desired information can be accessed, it then merely awaits the current geolocation data from the wireless network 640, which indicates the location of a wireless mobile unit 201 in one of a number of ways, so as to know when to trigger the application of the rules to the data and to trigger the output of data to the wireless mobile unit 201. Once the threshold, such as 5 miles from the airport, is triggered based upon the location of the wireless mobile unit 201, information is retrieved and modified and results of the expert system of IPA 330 are output from rule-based suggestion engine 600, formatted in element 650, and eventually output in a data push process 660 to the wireless mobile unit 201, through location-based server 221, WSC 220, and a controlling base station. It should be noted that FIG. 6 is merely exemplary to provide an illustration of how diverse data can be considered by a rule-based suggestion engine 600 of an IPA 330 to apply rules to data or information received; and to eventually modify and convey modified information to the user of a wireless mobile unit 201.

FIG. 7 is an example of how an IPA 330 is utilized in connection with the present invention to process data and redirect the traveler whose trip might be delayed by traffic. The IPA 330 is designated in this example of FIG. 7, by an IPA traffic module 780. The IPA traffic module includes a basic engine, denoted by traffic and routing suggestion engine 700. Traffic and routing suggestion engine 700 of IPA traffic module 780 is connected to the Internet 720, and therefore has access to current traffic data 730, historical traffic data 732, major/recurring events schedules 734 and road construction schedules 736. It further can be programmed or has access to a personal schedule of a user 702, familiar local routes of a user 704, and weighting factors 706. In addition, it receives current geolocation data from the wireless network 740, thereby enabling it to monitor positions of the wireless mobile unit 201 in any of the manners previously described.

In this specific example, a user of wireless mobile unit 201 desires to receive traffic information which can normally be obtained by monitoring the location of the wireless mobile unit 201 and having location-based server 221 access the Internet 320 to obtain and eventually send the wireless mobile unit 201 particular traffic information. However, utilizing IPA 330 and the example shown in FIG. 7, not only can traffic information be received, but traffic problems can be identified (by outputting modified traffic information) and the user can be rerouted around such traffic problems (by receiving new route information) as will be explained as follows.

IPA traffic module 780 of FIG. 7 is somewhat similar to the IPA 330 described with regard to FIG. 6. The heart of the process is traffic and routing suggestion engine 700 which is a rule-based suggestion engine analogous to that previously described with regard to FIG. 6. The traffic and routing suggestion engine 700, is this current example, is programmed with a rules that initiate processing and eventual formatting of traffic data in element 750 and pushing or sending of processed or modified traffic data indicating a heavy traffic flow for example (or new route information) in element 760 to the wireless mobile unit 201. The program rules within traffic and routing suggestion engine 700 trigger the output of information when an estimated travel time of a user, for example, exceeds certain preset limits or thresholds (e.g., 20% above normal).

More specifically, the traffic and routing suggestion engine 700 can be programmed so as to understand familiar local routes 704 and continually draw data through Internet 720 from external sources to obtain current traffic data 730, historical traffic data 732, major/recurring events schedule 734 and road construction schedules 736. The traffic and routing suggestion engine 700 can then compare the user's current location, obtained from current geolocation data element 740 in any of the manners described previously, to draw conclusions about whether to suggest a change in routes. Data input can be weighted using weighting factor 706, according to rules such as current traffic data 730 being much more influential than historical traffic data 732 for example, so as to have the traffic and routing suggestion engine 700 "decide" whether to output a recommendation to change routes to the wireless mobile unit 201. Other aspects, such as a major event, including sporting events or concert events for example, and road construction schedules may have a large weighting factor which would strongly dictate the issuance of rerouting information. The action taken in the instances where the traffic and routing suggestion engine 700 "decides" that rerouting is a good idea is the proactive push of traffic information to the wireless mobile unit 201 which is accomplished in a manner previously discussed with regard to the flowchart of FIG. 4 for example. The suggestion of alternative routes is an obvious extension of this, wherein stored mapping information can be used in conjunction with the various aspects of IPA 330 as shown in FIG. 7, to not only provide information indicating heavy traffic flow to the wireless mobile unit 201, but also alternative route suggestions.

Another example of how an IPA 330 can be used in connection with the location-based server 221 of the present invention, is an example wherein the IPA 330 is an IPA message sorting module 880 as shown in FIG. 8. In this case, the sorting of personal information messages such as email, facsimile and voicemail messages can be done by message sorting engine 800 of IPA message sorting module 880. The message sorting engine 800 can be programmed with location-based sorting rules 802 and user route preferences 804. It can receive external information such as electronically held messages 806, along with location information as identified by current geo-location data element 840. The message sorting engine 800 is further connected to the Internet 820, to obtain Internet derived messages 830 for example.

More specifically, FIG. 8 schematically illustrates how electronically held messages are considered by a rule-based message sorting engine 800 to eventually output modified message data, which is formatted in message data formatter and presenter 850, and eventually pushed as modified message data via 860 to a wireless mobile unit 201 depending upon the user's position or location. As with previous examples, the heart of this process is rule-based message sorting engine 800, which is analogous to rule-based suggestion engine 600 to FIG. 6 as described previously. The message sorting engine 800 is programmed with rules, including location-based sorting rules 802, that enable message modification by selection and sending of particular messages, or portion of messages, depending upon a user's location, and perhaps other aspects including the user's route or particular time of day. By understanding a user's route preference 804, which enables the message sorting engine 800 to identify a user's route currently traveled, the message sorting engine 800 can compare the user's current location, obtained from element 840, and the user's route and his/her proximity to a destination location (such as the

office, for example) to draw conclusions in a rule-based or expert system manner about what messages or message portions to forward, and with what level of detail. This sorting can be fairly simple, such as only being done once per day when the user approaches or is within 5 miles of the office to summarize the most important messages received overnight for example; and could also be used in a similar manner to summarize personal information messages (email, voicemail, facsimile, etc.) when a user is approaching home. As such, the wireless mobile unit **201** would receive email type messages or portions thereof, when within a threshold, such as 5 miles for example, of a certain remote location such as home, or office, or both.

The implementation of such message sorting based on the message's originator, content, etc. is well known to those of ordinary skill in the art and is commonly used with IPA devices. However, it is not commonly known to tie the user's location to the sorting or outputting of such information, and is certainly not common to use the user's location as derived from a wireless system as is taught in connection with the present application. It should be noted that message information can be any type of personal information which can be output and sent to a wireless mobile unit **201** in electronic form such as email or facsimile information, or in an audible form, based upon voicemail information for example. In addition, voicemail information can be converted to data for transmission to a wireless mobile unit **201**; and/or email information can be converted to audible information for output to the wireless mobile unit **201** as well. Accordingly, the present application should not be limited to the type of information which can be accessed nor to the type of information which can be output to wireless mobile unit **201**. It should be understood that other information can be output in a manner similar to that described generically with regard to FIG. **6**, and specifically with regard to traffic information of FIG. **7** and message sorting information with regard to FIG. **8**. Such information that can be processed and output to wireless mobile unit **201** includes, but is not limited to, airline flight and schedule information; summaries of important events from a user's calendar or schedule; etc.

One further example of location-based information delivery is presented here, to emphasize the generality of the method. Consider a subscriber to this type of location-based service system or method who has an appropriate wireless mobile unit **201** and is served by a network enabled with the ability to determine the phone's location and also has an IPA **330** assigned to him/her. The IPA **330** may be programmed with "knowledge" of the subscriber's particular interest, such as collecting art of a certain type for example. This type of art might be frequently available through the Internet (perhaps in auction sites) and advertised there. The subscriber, when traveling in circumstances that allow him/her to pursue their collecting hobby, can therefore request to be notified when objects of interest both become available and when he/she are in proximity to the seller. The IPA **330** periodically searches appropriate auction sites of the Internet and pulls data for comparison with the subscriber profile and current location as disclosed in FIGS. **3–5**. Thus, the location-based system and method of the present invention can use location-based information of the wireless mobile unit **201** of the user to convey relevant information back to the user in a timely manner. Because this collectable is of special interest only when it can be viewed in person, this may be a helpful criteria to pursuit and enjoyment of this type of collecting.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims. For example, the structure of location of location-based service database **302** is not limiting and need only store, in some fashion, the required information. How information is stored is not limitive of the present invention. Further, the location of various components or information storers of the location-based server **221** is not limitive of the present invention. The components can be in a single unit as shown in FIG. **3**, or can be located apart from location-based controller **301**. Only operative connection between components is important. The location-based server **221** of FIG. **3** is merely a description of a preferred structure.

What is claimed is:

1. An apparatus, comprising:

a controller, adapted to receive information indicating position of a wireless communications device;

a memory, adapted to store a telephone number of a remote information source, information identifying the wireless communication device and instruction information in association with the information identifying the wireless communication device,

the controller being adapted to output information for the wireless communication device based upon the stored instruction information, when the received information indicates that the position of the wireless communication device has satisfied a geographic relationship with a remote location, and to retrieve information for output to the wireless communication device using the telephone number of the remote information source.

2. The apparatus of claim **1**, wherein the information is output to the wireless communication device and received at the wireless communication device.

3. The apparatus of claim **1**, wherein the geographic relationship is satisfied when the position of the wireless communication device is within a designated distance of the remote location.

4. The apparatus of claim **1**, wherein the controller is adapted to compare position information of the wireless communication device to stored position information of the remote location and is adapted to determine when the wireless communication device has satisfied the geographic relationship.

5. The apparatus of claim **1**, wherein the wireless communication device is a wireless phone.

6. The apparatus of claim **1**, wherein the position information indicating position of the wireless communication device is received from a global positioning system (GPS) within the wireless communication device.

7. The apparatus of claim **1**, wherein the position information indicating position of the wireless communication device is received from an assisted global positioning system (assisted GPS).

8. The apparatus of claim **1**, wherein the information output includes traffic information.

9. The apparatus of claim **1**, wherein the information output includes airline information.

10. The apparatus of claim **1**, wherein the information output includes personal information.

11. The apparatus of claim **1**, wherein the memory stores position information of a plurality of remote locations in association with the information identifying a wireless communication device.

12. The apparatus of claim **11**, wherein the controller is adapted to output information to the wireless communica-

tion device upon receiving information indicating that the position of the wireless communication device is within a designated distance of the one of the plurality of the remote locations.

13. The apparatus of claim 1, wherein the memory stores information identifying a plurality of wireless communication devices in association with position information of the remote location.

14. The apparatus of claim 13, wherein the controller is adapted to output a control information to a wireless communication device upon receiving a signal indicating that the position of a respective one of the plurality of wireless communication devices is within a designated distance of the remote location.

15. The apparatus of claim 12, wherein the memory stores information identifying a plurality of wireless communication devices in association with position information of at least one of the plurality of remote locations.

16. The apparatus of claim 15, wherein the controller is adapted to output information to a wireless communication device upon receiving a signal indicating that the position of a respective one of the plurality of wireless communication devices is within a designated distance of the one of the remote locations.

17. The apparatus of claim 1, wherein the controller is adapted to retrieve the information from the remote information source through telephone lines.

18. The apparatus of claim 1, wherein the controller is adapted to retrieve the information from the remote information source through wireless communication.

19. The apparatus of claim 1, wherein the stored information identifying the wireless communication device includes a telephone number.

20. The apparatus of claim 1, wherein the information adapted to be output includes information associated with the remote location.

21. The apparatus of claim 2, wherein the information adapted to be output includes information associated with the remote location.

22. An apparatus, comprising:

a memory, adapted to store a telephone number of a remote information source, in association with information identifying a wireless communication device and position information of a remote location; and

a controller, adapted to output information for the wireless communication device when determining that a position of the wireless communication device has satisfied a geographic relationship with the remote location, and to retrieve information for output to the wireless communication device using the telephone number of the remote information source.

23. The apparatus of claim 22, wherein the information is output to the wireless communication device and received at the wireless communication device.

24. The apparatus of claim 22, wherein the position of the wireless communication device is determined at the controller through triangulation.

25. The apparatus of claim 22, wherein the geographic relationship is satisfied when the position of the wireless communication device is within a designated distance of the remote location.

26. The apparatus of claim 22, wherein the information adapted to be output includes information associated with the remote location.

27. The apparatus of claim 23, wherein the information adapted to be output includes information associated with the remote location.

28. A method, comprising:

storing a telephone number of a remote information source in association with position information of a remote location and information identifying a wireless communication device;

receiving information indicating a position of the wireless communication device; and

outputting information for the wireless communication device when the received information indicates that the position of the wireless communication device has satisfied a geographic relationship with the remote location.

29. The method of claim 28, wherein the information is output to the wireless communication device and received at the wireless communication device.

30. The method of claim 28, wherein the geographic relationship is satisfied when the wireless communication device is within a designated distance of the remote location.

31. The method of claim 28, further comprising: comparing the received position information of the wireless communication device to the stored position information of the remote location and outputting the information based upon the comparison.

32. The method of claim 28, wherein the information indicating position is received from a wireless telephone.

33. The method of claim 28, wherein storing includes storing position information of a plurality of remote locations in association with information identifying a wireless communication device.

34. The method of claim 33, wherein outputting includes outputting information upon receiving information indicating that the position of the wireless communication device is within a designated distance of the one of the plurality of the remote locations.

35. The method of claim 28, wherein the information identifying a wireless communication device includes a telephone number.

36. The method of claim 28, wherein a signal requesting information from the remote information source is output through telephone lines.

37. The method of claim 28, wherein a signal requesting information from the remote information source is output through wireless communication.

38. The method of claim 28, wherein the information output includes traffic information.

39. The method of claim 28, wherein the information output includes airline information.

40. The method of claim 28, wherein the information output includes personal information.

41. The method of claim 28, wherein the output information includes information associated with the remote location.

42. The method of claim 29, wherein the output information includes information associated with the remote location.

43. An apparatus comprising:

a controller; and

a memory, adapted to store information identifying the wireless communication device and instruction information;

the controller adapted to receive information indicating position of a wireless communications device, to access external information from an intelligent personal assistant (IPA) and output information for the wireless communication device based upon the stored instruction information and accessed external information

when received information indicates that the position of the wireless communication device has satisfied a geographic relationship with a remote location, and

the IPA adapted to modify the output information based on rules for the IPA included in the stored instruction information.

44. The apparatus of claim **43**, wherein the information is output to the wireless communication device and received at the wireless communication device.

45. The apparatus of claim **43**, wherein the geographic relationship is satisfied when the position of the wireless communication device is within a designated distance of the remote location.

46. The apparatus of claim **43**, wherein the controller is adapted to compare position information of the wireless communication device to stored position information of the remote location and is adapted to determine when the wireless communication device has satisfied the geographic relationship.

47. The apparatus of claim **43**, wherein the information output includes traffic information.

48. The apparatus of claim **43**, wherein the output information includes modified traffic information, wherein the IPA modifies traffic information received from an external source based upon stored rules, to produce modified traffic information for output to the wireless communication device.

49. The apparatus of claim **43**, wherein the output information includes route information, wherein the IPA receives traffic information from an external source and produces route information for output to the wireless communication device based upon the received traffic information.

50. The apparatus of claim **43**, wherein the information output includes airline information.

51. The apparatus of claim **43**, wherein the output information includes modified airline information, wherein the IPA modifies airline information received from an external source based upon stored rules, to produce modified airline information for output to the wireless communication device.

52. The apparatus of claim **43**, wherein the information output includes personal information.

53. The apparatus of claim **52**, wherein the personal information includes electronic mail.

54. The apparatus of claim **43**, wherein the output information includes modified personal information, wherein the IPA modifies personal information received from an external source based upon stored rules, to produce modified personal information for output to the wireless communication device.

55. The apparatus of claim **52**, wherein the personal information includes voicemail.

56. The apparatus of claim **43**, wherein the output information includes information associated with the remote location.

57. The apparatus of claim **44**, wherein the output information includes information associated with the remote location.

58. The apparatus of claim **44**, wherein the output information includes information associated with the remote location.

* * * * *